



United States  
Department of  
Agriculture



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Natural  
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National Park  
Service

# Soil Survey of Voyageurs National Park, Minnesota









# How To Use This Soil Survey

## General Soil Map

The general soil map, which is a color map, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

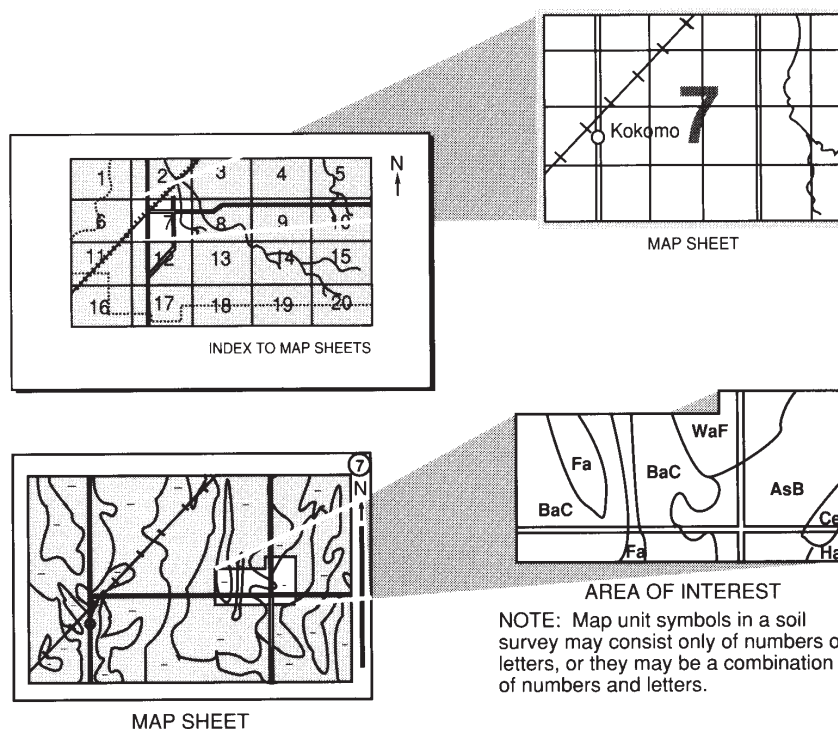
## Detailed Soil Maps

The detailed soil maps can be useful in planning the use and management of small areas.

To find information about your area of interest, locate that area on the **Index to Map Sheets**. Note the number of the map sheet and go to that sheet.

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Go to the **Contents**, which lists the map units by symbol and name and shows the page where each map unit is described.

The **Contents** shows which table has data on a specific land use for each detailed soil map unit. Also see the **Contents** for sections of this publication that may address your specific needs.









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## National Cooperative Soil Survey

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey. This survey was made cooperatively by the Natural Resources Conservation Service and the National Park Service. It is part of the technical assistance furnished to the St. Louis and Koochiching County Soil and Water Conservation Districts.

Major fieldwork for this soil survey was completed in 2012. Soil names and descriptions were approved in 2013. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 2014. The most current official data are available on the Internet (<http://websoilsurvey.nrcs.usda.gov/app/>).

The soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, the maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

## Literature Citation

The correct citation for this survey is as follows:

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## Cover Caption

View of Voyageurs National Park showing the Canadian Shield bedrock, boreal forest, and lake.

*Additional information about the Nation's natural resources is available online from the Natural Resources Conservation Service at <http://www.nrcs.usda.gov/>.*



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# Preface

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This soil survey was developed in conjunction with the National Park Service's Soil Inventory and Monitoring Program and is intended to serve as the official source document for soils occurring within Voyageurs National Park, Minnesota.

This soil survey contains information that affects current and future land use planning in the park. It contains predictions of soil behavior for selected land uses. The survey highlights soil limitations, actions needed to overcome the limitations, and the impact of selected land uses on the environment. It is designed to meet the needs of the National Park Service and its partners to better understand the properties of the soils in the park and the effects of these properties on various natural ecological characteristics. This knowledge can help the National Park Service and its partners to understand, protect, and enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. The information in this report is intended to identify soil properties that are used in making various land use or land treatment decisions. Statements made in this report are intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. The location of each map unit is shown on the detailed soil maps. Each soil in the survey area is described, and information on specific uses is given. Help in using this publication and additional information are available at the local office of the Natural Resources Conservation Service or the park office for Voyageurs National Park.



# Soil Survey of Voyageurs National Park, Minnesota

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United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with the United States Department of the Interior, National Park Service

VOYAGEURS NATIONAL PARK is located along the border between Minnesota and Ontario (see locator map). It consists of 218,200 acres, including 134,246 acres of land and 83,808 acres of water (Graham, 2007).

In 1971, President Nixon signed Public Law 91-661, authorizing the creation of Voyageurs National Park and designating its boundaries. The park was established in 1975 and intended to preserve the local scenery, geological conditions, and waterway system.

The park is named for the French Canadians who transported beaver furs by canoe during the 17th and 18th centuries. These people were called by the French term “voyageurs.” Beaver from the lakes and drainageways of the survey area were trapped by Ojibwa native residents.

All of the survey area is within Major Land Resource Area (MLRA) 93, Superior Stony and Rocky Loamy Plains and Hills. MLRAs are geographically associated land resource units which approximate broad agricultural market regions. Land resource units are generalized categories of resource management considerations that have significant geographic differences in soils, climate, water resources, or land use. Land Resource Unit 93C, Border Lake Bedrock Complex, is being developed for an area that includes the park (fig. 1). This land resource unit is characterized by bedrock-controlled topography. It has a relatively high degree of bedrock outcrop and a high content of rock fragments in the overburden. It is also an area where Spodosols are forming (see the section “Formation of Soils”).

## General Nature of the Park

This section briefly discusses the physiography and drainage, geology, soils and stratigraphy, and climate of the survey area.



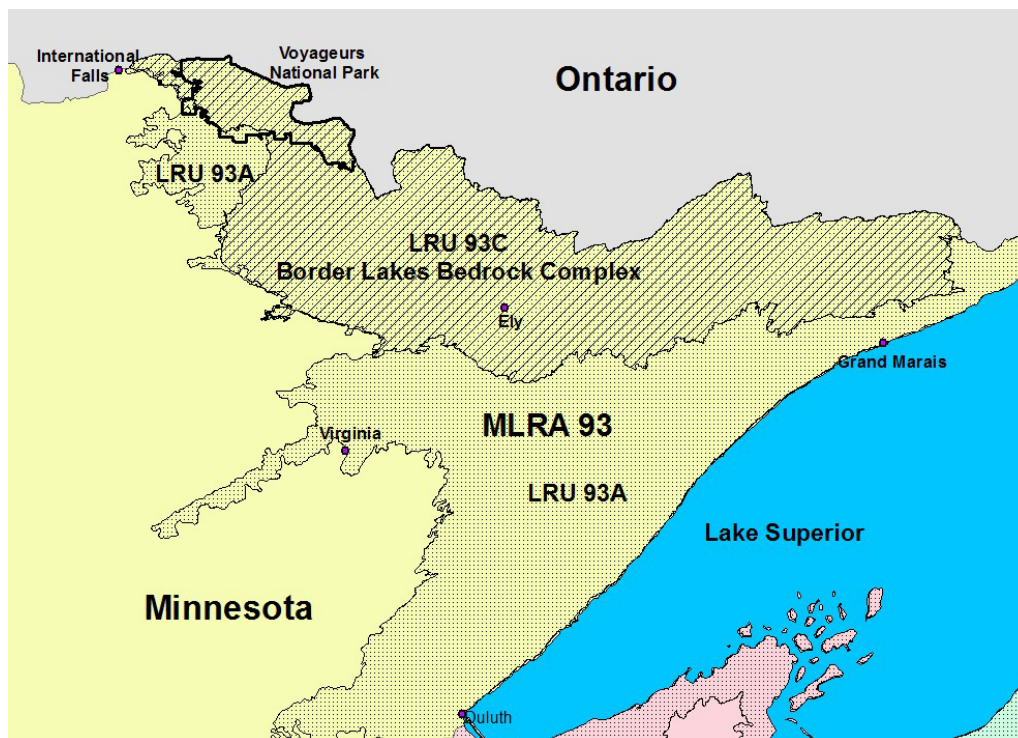


Figure 1.—Map showing MLRA 93 and proposed Land Resource Unit 93C—Border Lake Bedrock Complex.

## Physiography and Drainage

Voyageurs National Park has irregular bedrock-controlled topography. Elevations range from about 336 meters (1,102 feet) to 428 meters (1,404 feet) (see locator map). Kabetogama Lake and Namakan Lake flow into Rainy Lake. The Rainy River flows out of Rainy Lake in route to Lake of the Woods, which drains into Hudson Bay. Voyageurs National Park is the only national park in the Hudson Bay watershed (Graham, 2007).

Beaver dams block drainageways and cause flooding in several areas, affecting the ecology, drowning trees, and creating wetlands. These areas are delineated as map unit 2srb—Aquents, Sax, and Tacoosh soils, 0 to 1 percent slopes, ponded.

## Geology

Voyageurs National Park is at the southern end of the Canadian Shield, in part of the Superior Province. The Canadian Shield is a large area of Precambrian, medium and coarse grained, crystalline igneous and metamorphic rocks. It forms the core of the North America continent (Graham, 2007) (fig. 2) and dominates most of Ontario (Card, 1986). Schist and gneiss underlie most of the park (Hemstad et al., 2002) (fig. 3). During the last ice age, glaciers passing over the survey area came from an ice dome amassed over Hudson Bay. The glacial till that thinly covers the park is from Ontario. It was transported by a glacier that scoured across the Canadian Shield, ripping up and grinding the bedrock.

The Canadian Shield is an ancient earth surface that has been eroded down to core intrusive bedrock formed from lava. As the lava cooled beneath the earth, the minerals crystallized and formed larger grains (Ojakangas and Matsch, 1982). The glacial abrasion and weathering of this bedrock resulted in till with a characteristically coarse grained, gritty texture and a low clay content. Also, because of the park's nearness to

## Soil Survey of Voyageurs National Park, Minnesota

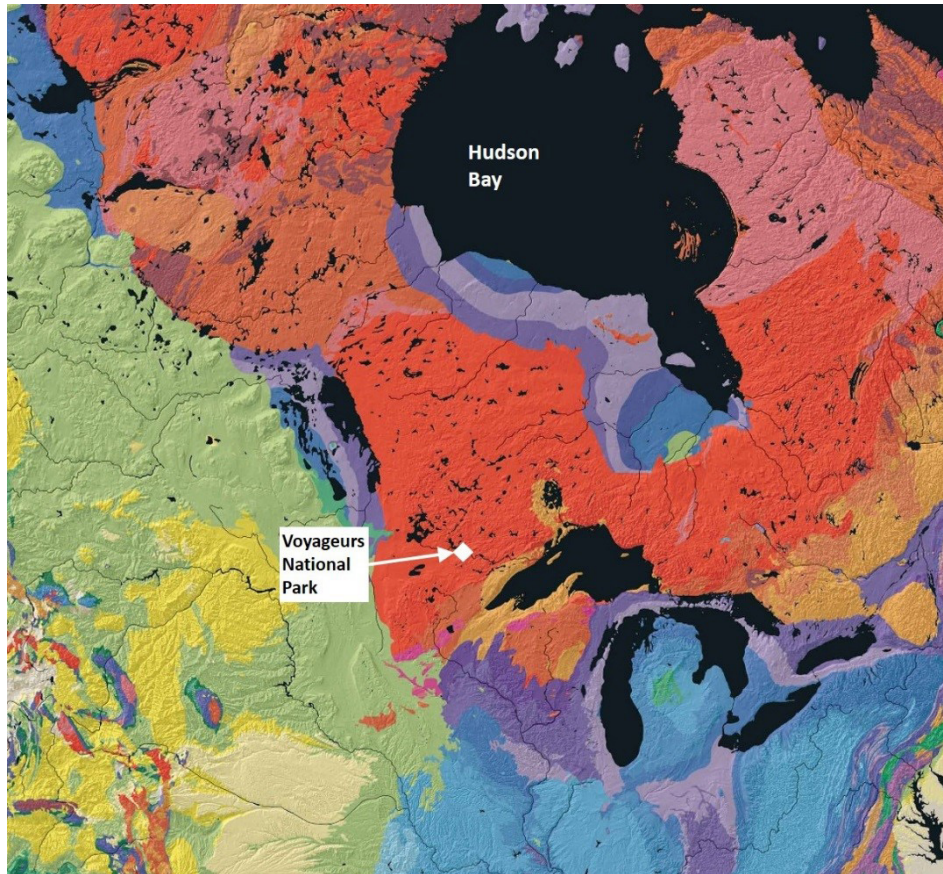


Figure 2.—Map showing the Precambrian Canadian Shield within the red and brown areas (image from Barton et al., 2003).



Figure 3.—An outcropping of igneous and metamorphic bedrock at a campsite by Sullivan Bay on Kabetogama Lake.





**Figure 4.—Quartz and biotite mica minerals in felsic rock near Mica Island on Kabetogama Lake.**

the source of this bedrock, the glacial till contains a high content of cobbles, stones, and boulders. The source does not contain limestone sedimentary rocks, which are very high in calcium and magnesium. These bases have the effect of buffering the soil pH. Without them, the coarse-loamy till is prone to leaching and acidification. In contrast, the lake-deposited sediments in the park that are from glacial meltwater flowing from western Minnesota and Manitoba were originally derived from the Winnipeg lowlands, which do contain limestone.

The Canadian Shield rocks are felsic—high in silica and relatively low in iron and magnesium. They result from subduction volcanic activity, where silica becomes more concentrated in lava. The minerals formed are dominantly quartz and include varying amounts of feldspar, muscovite, biotite, and hornblende amphiboles (Haldar and Tišljär, 2014) (fig. 4). Under humid, cooler conditions, the chemical weathering of this type of felsic rock produces goethite,  $\text{FeO}(\text{OH})$ , which is a type of iron mineral that gives the soil a brown color.

The bedrock is impervious to water, except where it has cracks and seams. Consequently, it is an aquitard, holding up the water in the soil as it moves downslope across the landscape and discharges into lakes and drainageways. The water follows and concentrates along irregularities of the bedrock contact. One of the soils sampled in the park, an Insula (see appendix 3), is located near the summit of a hillslope, below a shoulder slope. In this area, water flows over bedrock at the confluence between outcropping rock and creates an ephemerally wet condition. At this wet confluence, the Insula soil has an organic-rich surface layer with 21.67 percent total carbon.

The Wisconsin Ice Age, during which most of Minnesota was covered by glaciers, ended about 11,000 years ago (Graham, 2007). In the survey area, the glacial action mostly occurred beneath the ice, as abrasion, scouring, and quarrying (Ojakangas



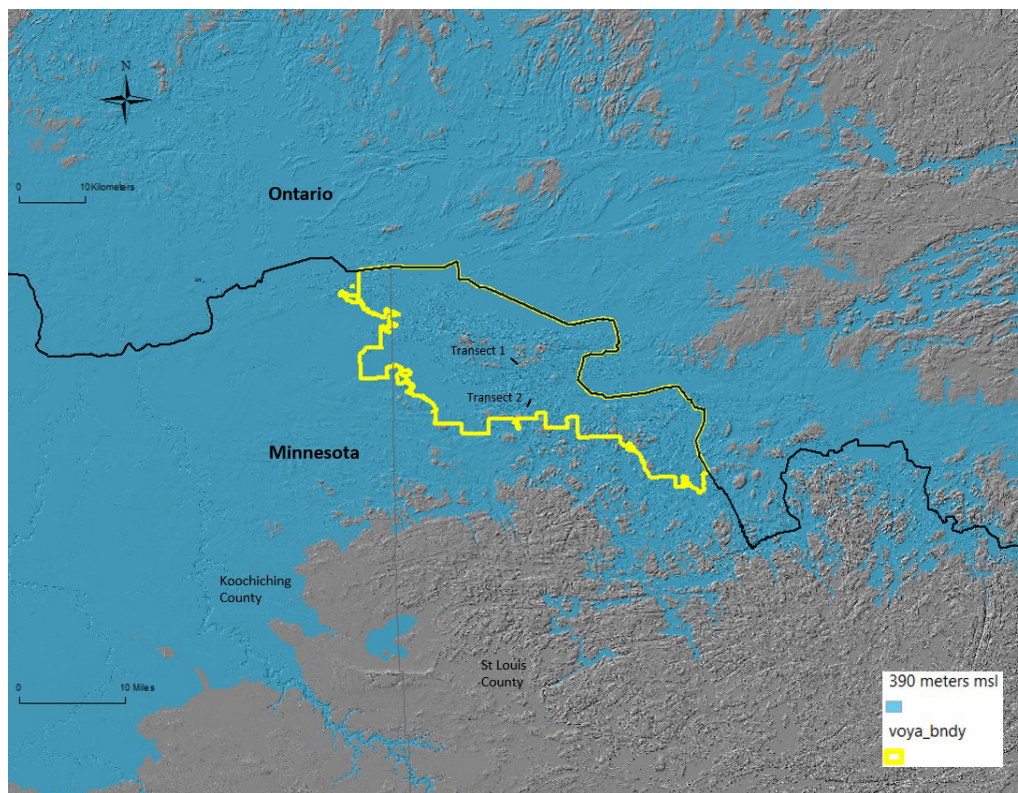


**Figure 5.—Approximate extent of Lake Agassiz. Voyageurs National Park is located on the southeast edge.**

and Matsch, 1982). Quarrying of bedrock occurs when water at the base of the glacier refreezes onto large joint blocks and the advancing ice sheet carries away fragments of the blocks. The resulting landscape has deep lakes and irregular topography. Throughout the park, the till that was deposited as the glacier melted in retreat is thin and there are many rock outcrops. Glacial till is much thicker across the rest of Minnesota. Sandy and gravelly outwash left by meltwater flowing from the retreating glaciers is also not extensive in Voyageurs National Park and the Boundary Waters Canoe Area compared to the rest of Minnesota, where the margin of the glacier fluctuated more.

Near the end of the Wisconsin Glaciation, while the continental glacier extended across northern Canada and blocked the Hudson Bay watershed outlet, the southern margin of the glacier melted away. This meltwater pooled, forming Glacial Lake Agassiz. This glacial lake covered nearly 365,000 square miles (fig. 5), over 11 times the size of Lake Superior (Blumle, 2004). However, it did not cover the entire area at any single time. As the lake drained, the ice margin retreated north. Lake Agassiz covered the survey area from about 12,000 to 9,500 years before present (Clayton, 1983).

The formation of Lake Agassiz was complex. The retreating glacier impounded the northern boundary of Glacial Lake Agassiz. As the meltwater filled this basin, it reached different overflow channels (Mann et al., 1999). Deglaciation caused a rapid release of the ponded water, which opened outlets at lower elevations (Leverington and Teller, 2003). The park sits at the upper level of Glacial Lake Agassiz, on the



**Figure 6.—Map showing approximate lake level of Glacial Lake Agassiz, at 390 meters above mean sea level, and locations of transects 1 and 2. The park was inundated with glacial meltwater starting approximately 12,000 years ago.**

southeastern shoreline. As the lake level rose, water began to back up the Rainy River and drain through Lake Superior and the St. Lawrence Seaway (Clayton, 1983; Teller and Thorleifson, 1983) (fig. 5). The outlet over the Canadian Shield bedrock resisted downcutting, and as the glacial lake continued filling, water topped the outlet in Browns Valley in western Minnesota and began to cut down the Minnesota River valley. Eventually, the ice retreated further and the Hudson Bay outlet was opened.

The survey area was completely inundated by glacial meltwater at an early stage of Glacial Lake Agassiz. The lake had different phases (Teller and Thorleifson, 1983). For example, the Herman phase was a relatively stable period during which the lake level reached 390 meters in elevation. The present-day digital elevation model showing this level, in figure 6, helps one to visualize this massive water body and the size of waves it had. Initially, however, the meltwater would have ponded into small ice marginal lakes that were at higher elevations and that eventually were integrated into a larger body of water. The elevation range of the park is 336 to 428 meters above mean sea level. The highest point in the survey area where soil scientists took samples of soil associated with lacustrine (lake-deposited) sediments from Glacial Lake Agassiz was 384 meters. Soil descriptions associated with glaciolacustrine sediments that are higher than 430 meters above sea level have been described south of the park in St. Louis County and east of the park in the Boundary Waters Canoe Area. Meltwater filling Glacial Lake Agassiz carried finely ground earthen material called glacial flour. Within Voyageurs National Park, this lacustrine sediment is dominantly silty but it has varying clayey textures or surficial strata of sandier or loamy sediments.

## Soils and Stratigraphy

The most common soil series mapped in the park is the Insula series (28,128 acres). Insula soils formed in a thin, coarse-loamy, glacial till mantle (25 to 50 centimeters thick) underlain by bedrock. The Spooner series (5,247 acres) is the most common soil in the park that formed in very deep, silty, lacustrine deposits from Glacial Lake Agassiz. Associated with this silty parent material and the underlying coarse-loamy mantled bedrock is a new soil identified in the park called Voyageurs (4,081 acres)(see appendix 1 for draft of the official soil series description). The Voyageurs soil has a sequence of glacial sediment overlying bedrock that had not been identified prior to this soil survey. The drier Insula soils are on hillsides and summits. The hydric Spooner soils are typically in drainageways of wet, flat lowlands. Voyageurs soils, which fall between the drainage sequence marked by the other two soil types, are on flat summits that have slower runoff.

Almost every map unit in the park has an inclusion of a lacustrine soil. Figure 6 shows a stage of Glacial Lake Agassiz when 95 percent of the survey area was under water (at earlier stages, the area was completely inundated). The stratigraphy of sediments is not simply related to elevation, where lacustrine soils dominate areas below 390 meters. In this rugged landscape, depending upon position on the geomorphic surface, the soil would either tend to accumulate lacustrine sediments or be exposed to erosion and wave action as the glacial lake receded. Of the 244 pedons of Insula soil identified within the park, most are below 390 meters in elevation (fig. 7). It is easy to imagine how the southeastern shoreline of Glacial Lake Agassiz was subject to severe wave action and eroded of surface sediments, especially on the exposed backslopes. Of the 52 pedons of Spooner soil identified in the park, most occur at the lower elevations, in drainageways and flats (fig. 8). The 41 pedons of Voyageurs soil identified within the park show a more random distribution, occurring at elevations ranging from 340 meters to 377 meters (fig. 9). At stops 3 and 5 in transect 1, Voyageurs soil was identified on footslopes where a thin layer of lacustrine sediments accumulated. An oblique view of this area illustrates how lacustrine sediments at this location would accumulate. Brief soil descriptions of transect 1 are included in appendix 2.

Lacustrine sediments from Glacial Lake Agassiz accumulated on linear topographic summits and in slightly concave interfluvial areas that were not subject to the full intensity of wave action and erosion. The Voyageurs soil was recorded at stop 7 in transect 2 in a flatter slope position, just back from the shoulder of the hill grading down to the lake. Figures 10 and 11 show the cross section of transect 2 and estimate the stratigraphy of the glacial sediments and bedrock. They show the discontinuous and variable nature of the glacial sediments across the bedrock-controlled landscape. The soil descriptions for transect 2 are included in appendix 2.

The Voyageurs soil was identified in a study area near the Ash River Visitor Center in Voyageurs National Park. Figure 12 shows the sediment stratigraphy of this upland landscape. The poorly drained phase of the Voyageurs soil was correlated to the Spooner, bedrock substratum, taxadjunct. The Conic soil is similar to the Insula soil but has thicker layers of coarse-loamy till. The Wahlsten soil is similar to the Conic soil but is moderately well drained.

Since the Pleistocene-age glaciation, more recent Holocene-age organic deposits have accumulated in places on top of the mineral sediments. The accumulations occur mostly in hydric soils in lowlands or depressions, such as bogs and swamps. Under wet soil conditions and the colder climate of northern Minnesota, organic matter from sedge grasses, sphagnum mosses, and woody fragments from trees accumulate in layers up to several meters thick. Carbon accumulates or sequesters because decomposition under anaerobic conditions is less efficient and more vegetative material is added each growing season (Moore, 1989). On better drained upland soils,



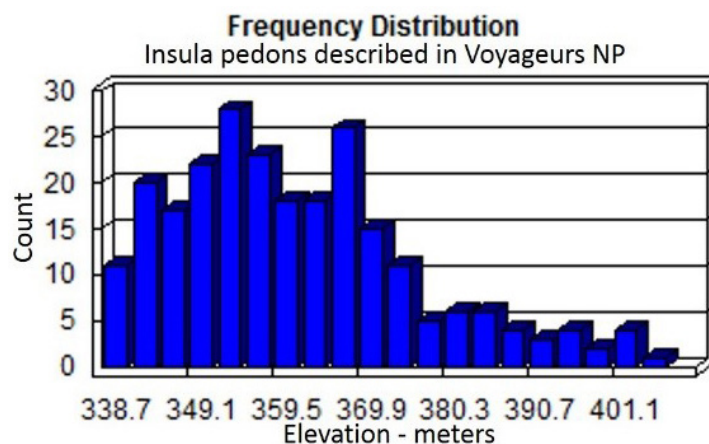


Figure 7.—Elevational distribution of the 244 Insula pedons in the park.

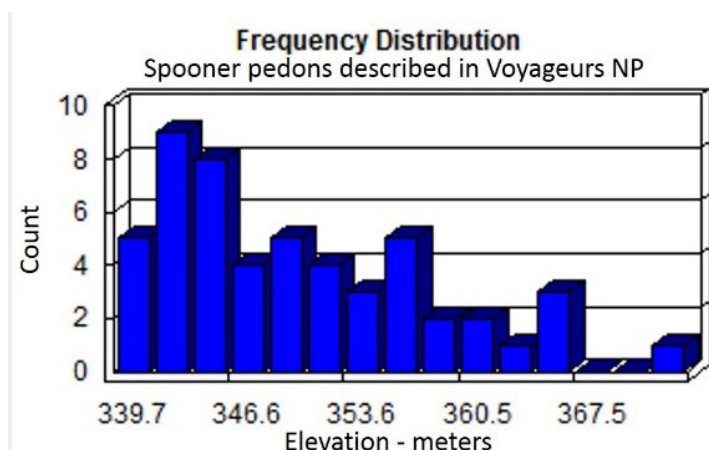


Figure 8.—Elevational distribution of the 52 Spooner pedons in the park.

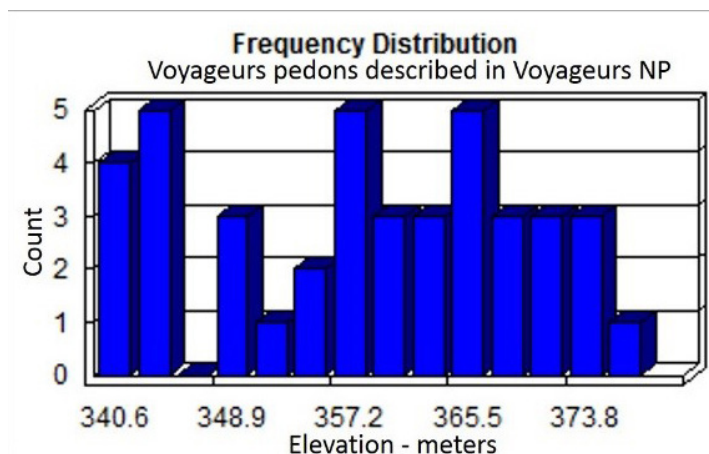


Figure 9.—Elevational distribution of the 41 Voyageurs pedons in the park.

## Soil Survey of Voyageurs National Park, Minnesota

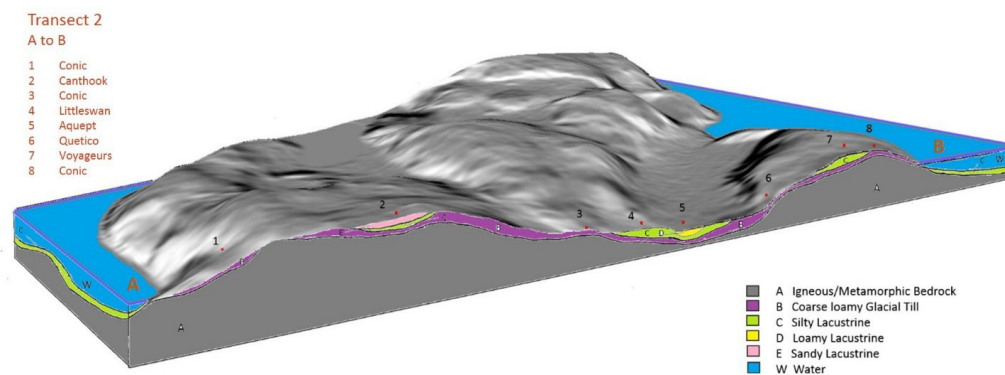


Figure 10.—Cross-sectional diagram of transect 2 showing the variable and discontinuous amount of sediments and the bedrock-controlled topography.

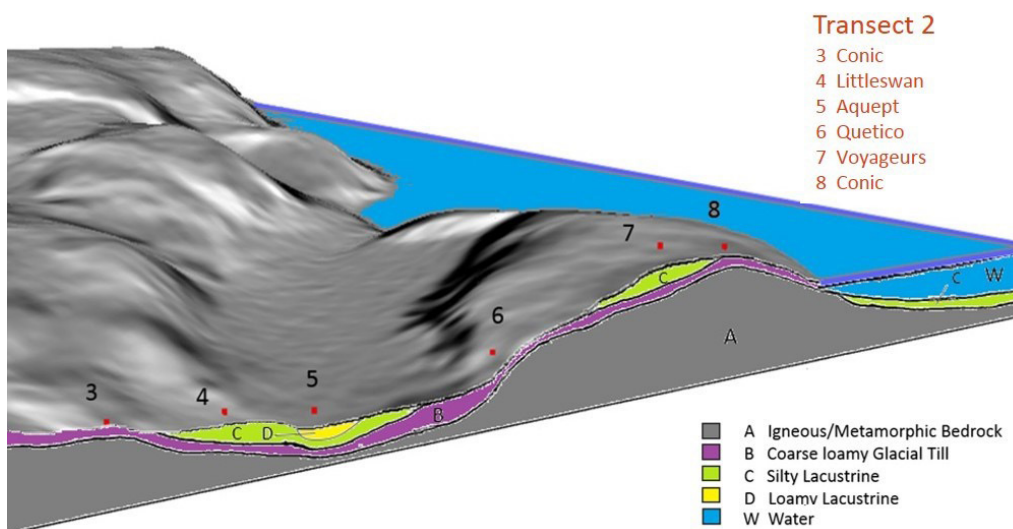


Figure 11.—Cross-sectional diagram of transect 2 (enlarged area of figure 10). The Voyageurs soil at stop 7 shows the discontinuous nature of Glacial Lake Agassiz sediments in summit positions.

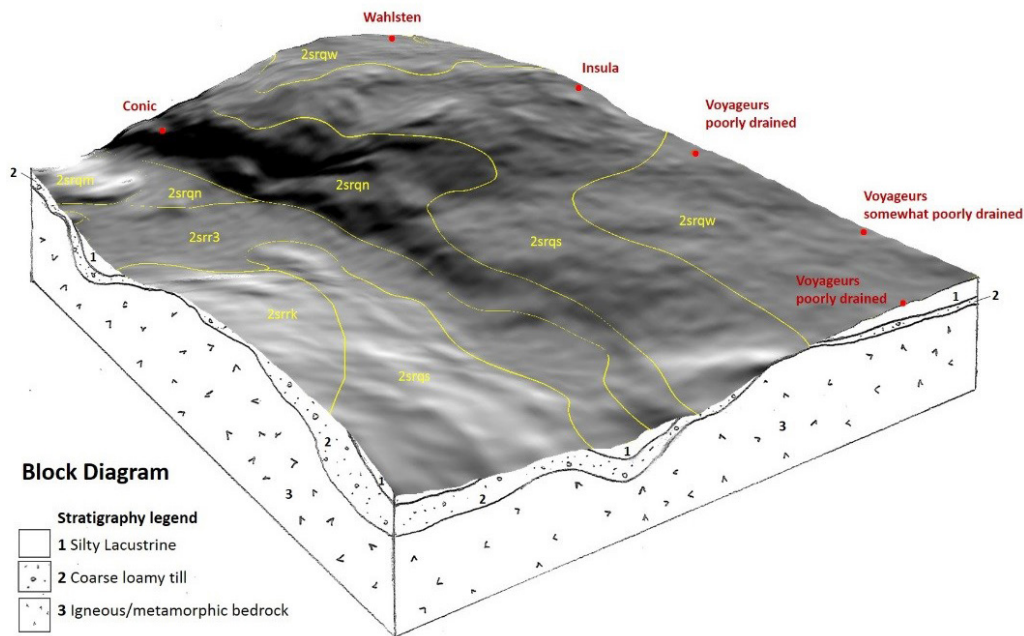
where oxygen affects the decomposition cycle, only a thin organic layer accumulates at the surface under the leaf litter.

## Climate

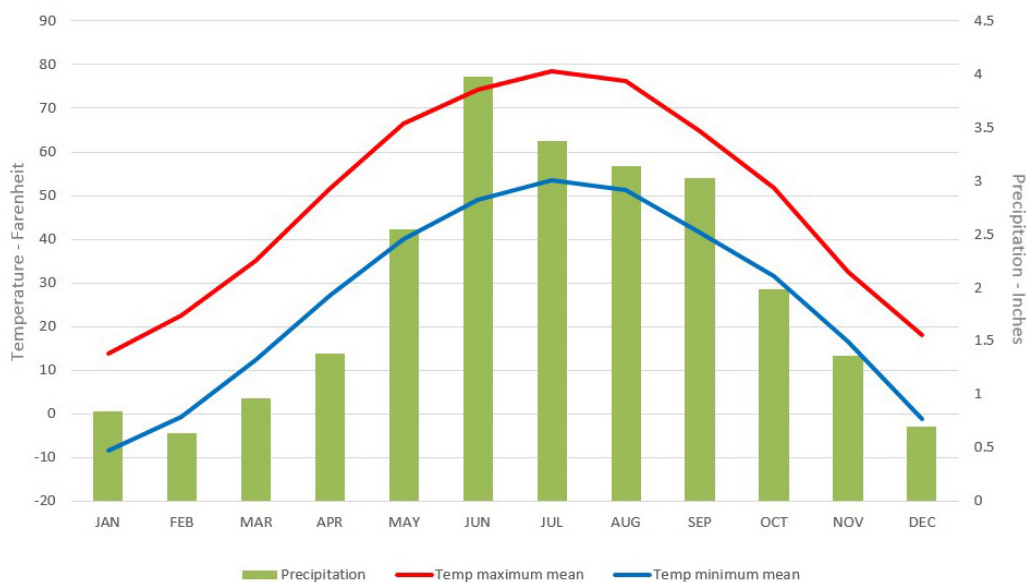
Table 1 gives data on temperature and precipitation for the survey area as recorded at the airport at International Falls, Minnesota, in the period 1981 to 2010. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on the length of the growing season. Figure 13 shows the monthly breakdown of the annual precipitation and temperature averages.

Voyageurs National Park has a cool, subhumid climate. There is a wide variation in temperature between summer and winter, with about 115 frost-free days between May 25 and September 17. At the airport in International Falls, the hottest day of the year, on average, is July 24, with daily average temperatures ranging from 56 to 78 degrees F. On average, the coldest day of the year is January 15, with average daily

# Soil Survey of Voyageurs National Park, Minnesota



**Figure 12.—Representation of soil study area near Ash River Visitor Center.**



**Figure 13.—Monthly average temperature and precipitation for the period 1971-2000 at International Falls, Minnesota.**

temperatures ranging from -3 to 16 degrees F. The lowest temperature on record, which occurred at International Falls on January 21, 2011, was -46 degrees. The highest temperature, which occurred at International Falls in June 1923, was 103 degrees.

Growing degree days are shown in table 1. They are equivalent to “heat units.” During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal



monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The average annual total precipitation is about 24 inches. The greatest amount of precipitation occurs during June (fig. 13). The monthly average precipitation in July is 3.37 inches.

The average seasonal snowfall is 71 inches. The earliest measurable snowfall on record (1 centimeter) occurred on September 14, 1964, at International Falls. It is a Minnesota State record.

## How This Survey Was Made

This survey was made in conjunction with the National Park Service's Soil Inventory and Monitoring Program to provide information about the soils and miscellaneous areas in Voyageurs National Park. The soil survey of Voyageurs National Park was initiated in 2011. Fieldwork for the project commenced and continued through 2014. The work involved describing, characterizing, and mapping 139,533 acres of park land. This effort also involved establishing a new series—the Voyageurs series (see appendix 1 for the official soil series description).

During the soil survey, soil component relationships were observed and soil-site correlation concepts were established to help in designing the map units. Soil and plant specialists tested the concepts during mapping and collected field documentation at numerous points across the landscape.

The information in this survey includes a description of the soils, interpretations for suitabilities and limitations, and 1:24,000-scale maps. Soil scientists observed the steepness, length, and shape of the slopes, the general pattern of drainage, the kinds of native plants, and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils in the survey area are in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil is associated with a particular kind of landform or with a segment of the landform. By observing the soils in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles in excavations up to 2 meters deep. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enabled them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes.

Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil Taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the

individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area are collected for laboratory analyses and for engineering tests. A list of the soil pedons that were submitted to the Kellogg Soil Survey Laboratory in Lincoln, Nebraska, for complete soil characterization is included in appendix 3. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

### The Use of Light Detection and Ranging (LiDAR)

Gathering LiDAR data involves flying over the project area in narrow, parallel lines, shooting out as many as 50,000 laser pulses per second, and measuring the amount of time the pulses take to reflect off of the bare earth and tree canopy back to

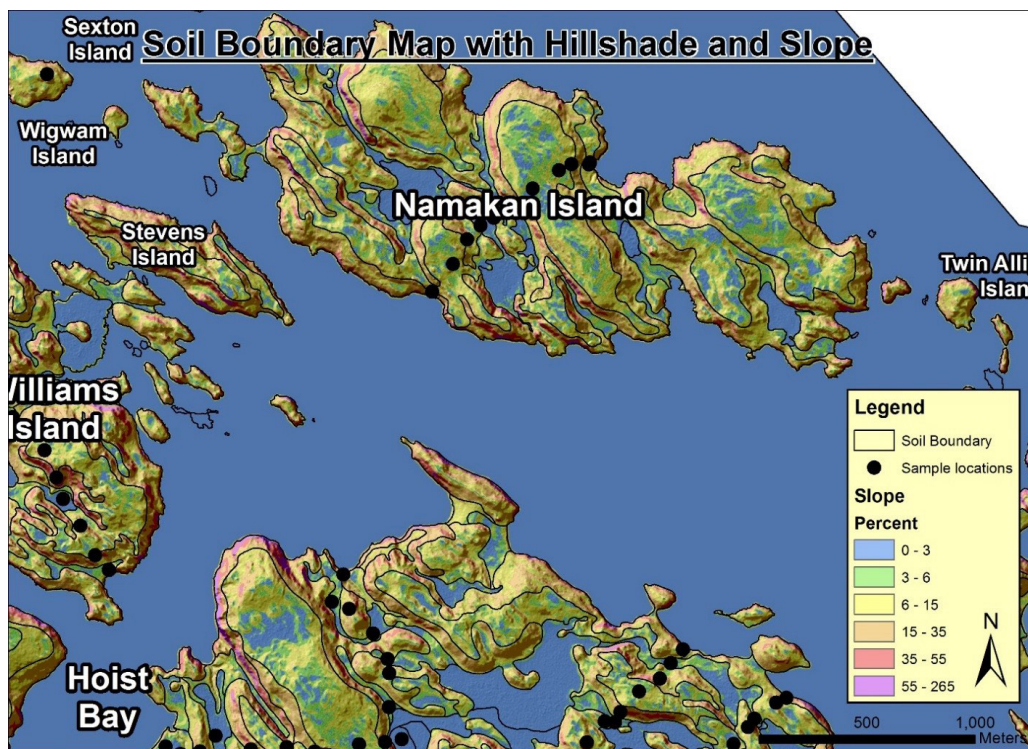


Figure 14.—LiDAR-generated slope terrain model for the vicinity of Namakan Island. The boundaries of soil map units are also shown as well as soil data collection points along transect lines.

an airborne sensor. The resulting “point cloud” is processed into files that represent elevation values of x, y, and z coordinates for each meter area of the file’s geographic extent in ESRI grid format. The use of LiDAR, in conjunction with geographic information system (GIS) software, is one of the most important innovations in soil survey in over 30 years. The specified vertical accuracy of the z coordinates is plus or minus 15 centimeters. This level of accuracy allows soil scientists to delineate soil map unit boundaries at an extremely accurate level of detail. The many benefits and uses of the LiDAR data in Voyageurs National Park are described in the following paragraphs.

Utilizing the LiDAR elevation data and ArcGIS Spatial Analyst, scientists created hillshade and slope terrain models at 3-meter resolution. These terrain models, along with the high-resolution aerial imagery, served as the base maps for interpreting soils on the landscape model. Scientists also used 1-meter resolution true-color aerial photography and color-infrared aerial photography.

This soil survey was unconventional for the region for a number of reasons. Firstly, conventional stereoscopes and offset aerial photo pairs (for interpreting the landscape in three dimensions) were not used. Instead, LiDAR hillshade and slope terrain models were used (fig. 14). This allowed for a very consistent and accurate interpretation of the landscape model. Secondly, all field data was georeferenced and uploaded progressively into an ArcGIS database. This allowed scientists to quickly and accurately review soil sample data on a spatial backdrop.

In addition to the LiDAR base maps and imagery, other nontraditional survey techniques were employed. All sample locations were predetermined using the LiDAR hillshade model. As a result, soil sample locations were logically situated in a consistent manner across the landscape. This allowed equal and unbiased data collection. It also gave park staff an opportunity to review the locations and flag potential sites for archeological investigations. At each predetermined point, the scientist described the soil, recorded their findings, and then uploaded the data into an ArcGIS database for spatial analysis.

Once all of the soil map units were digitized using the LiDAR base maps, they were grouped together based on landscape position and slope similarities. The field point data was then stratified out for each of these groups of map units. The lines of soil map units were refined again, if needed, using the field point data results and then ultimately summarized to determine soil component composition.



# General Soil Map Units

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The general soil map in this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. (In figure 15, the locations of mapping transects are superimposed on the general soil map.) These broad areas are unique natural landscapes. They are named for the major soils. Minor soils are included in the descriptions. The components of one general soil map unit can occur in another but in a different pattern.

The general soil map was created by combining soil survey map units to show the generalized extent of the shallow glacial till soils, lacustrine sediments, and organic deposits within the bedrock upland. This map is useful for understanding the general nature of the survey area. It can be used to compare the suitability of large areas for general land uses. Because of its small scale, the map is not suitable for management of soils at a detailed level. The soils in any one general soil map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The following list groups each general soil map unit with detailed soil map units according to similar parent material.

## **Insula-Conic-Quetico (General Soil Map Unit 1)**

- 2srmd Quetico-Insula, bouldery-Rock outcrop complex, 3 to 18 percent slopes, LRU 93C
- 2srqm Quetico-Insula, bouldery-Rock outcrop complex, 8 to 60 percent slopes
- 2srqn Insula-Conic-Rock outcrop complex, 8 to 25 percent slopes, very bouldery
- 2srqp Quetico-Insula, very bouldery-Greenwood complex, 0 to 12 percent slopes, very rocky
- 2srqs Insula-Conic-Wahlsten complex, 0 to 12 percent slopes, very stony, very rocky
- 2srrk Insula-Conic-Wahlsten complex, 0 to 25 percent slopes, very stony, very rocky
- 2srrr Insula, very stony-Voyageurs-Wahlsten, very stony complex, 0 to 12 percent slopes, very rocky

## **Spooner-Sax-Voyageurs (General Soil Map Unit 2)**

- 2srqv Voyageurs, oxyaquic-Conic, very stony-Littleswan complex, 0 to 12 percent slopes, rocky
- 2srqw Wahlsten, very stony-Spooner-Voyageurs complex, 0 to 8 percent slopes, rocky
- 2srqy Baudette-Littleswan complex, 0 to 8 percent slopes
- 2srqz Canthook-Durkeelake complex, 0 to 12 percent slopes
- 2srr3 Spooner-Sax complex, 0 to 2 percent slopes
- 2srr4 Littleswan-Spooner complex, 0 to 3 percent slopes
- 2srrb Aquents, Sax, and Tacoosh soils, 0 to 1 percent slopes, ponded
- 2srrm Brickton-Hassman complex, 0 to 2 percent slopes
- 2srrn Brickton-Dalbo complex, 0 to 3 percent slopes



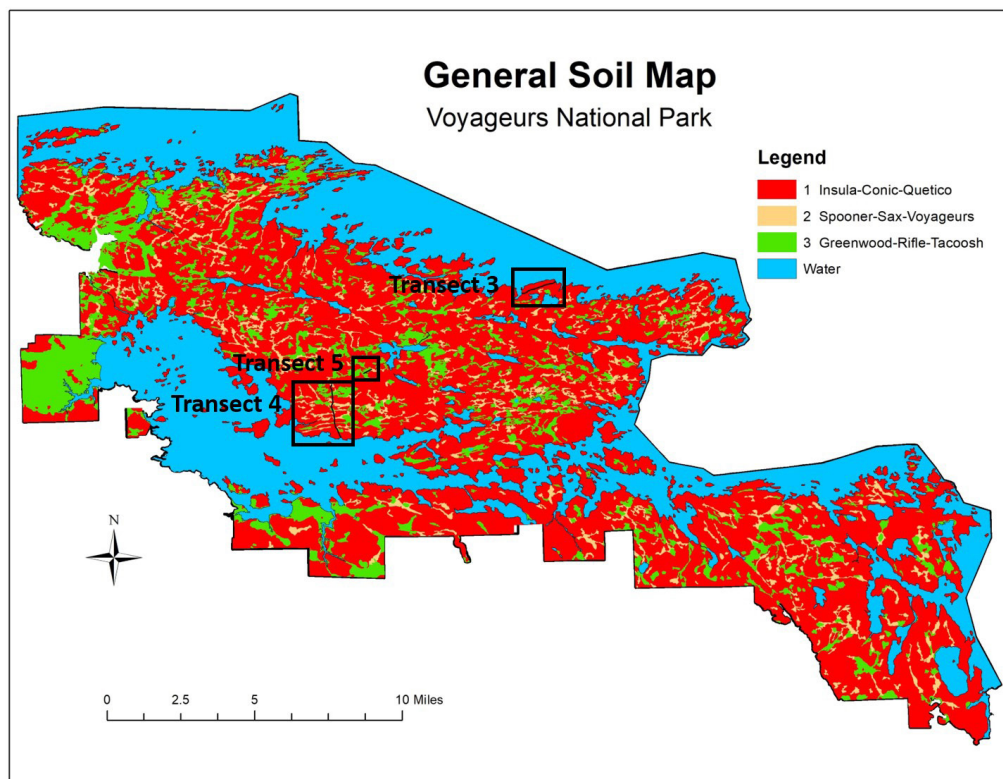


Figure 15.—General soil map and locations of transects.

### Greenwood-Rifle-Tacoosh (General Soil Map Unit 3)

- 2srqr Greenwood peat, 0 to 1 percent slopes
- 2srr7 Mooselake mucky peat, 0 to 1 percent slopes
- 2srr8 Rifle mucky peat, 0 to 1 percent slopes
- 2srr9 Tacoosh and Sax soils, 0 to 1 percent slopes, frequently flooded
- 2srrh Greenwood peat, 0 to 1 percent slopes, seasonally ponded
- 2srrj Rifle mucky peat, 0 to 1 percent slopes, seasonally ponded
- 2srrl Tacoosh and Sax soils, 0 to 1 percent slopes, occasionally flooded
- 2srrq Cathro and Tacoosh soils, 0 to 1 percent slopes, ponded
- 2srrt Bowstring and Fluvaquents soils, 0 to 2 percent slopes, frequently flooded

### 1. Insula-Conic-Quetico (see figures 16 and 17 at end of section)

*Extent of the map unit within the survey area: 63 percent*

*Extent of components within the map unit:*

- Insula soils—31 percent
- Conic soils—22 percent
- Quetico soils—18 percent
- Wahlsten soils—14 percent
- Rock outcrop—9 percent
- Aquepts—3 percent
- Voyageurs soils—3 percent



### ***Description of Components***

#### **Insula, very stony, skeletal and similar soils**

*Position on the landscape:* Shoulder and backslope

*Slope range:* 3 to 35 percent

*Texture of the surface layer:* Very flaggy moderately decomposed plant material

*Depth to restrictive feature:* 25 to 51 centimeters to lithic bedrock

*Parent material:* Loamy drift over igneous bedrock

*Drainage class:* Well drained

*Flooding:* None

*Ponding:* None

*Hydric soil status:* No

*Depth to seasonal water table:* More than 200 centimeters

*Available water capacity to a depth of 150 centimeters:* Very low (about 4.1 centimeters)

*Content of organic carbon to a depth of 2 meters:* 6 kg/m<sup>2</sup>

*Taxonomic classification:* Loamy-skeletal, isotic, frigid Lithic Dystrudepts

#### **Conic, very stony, skeletal and similar soils**

*Position on the landscape:* Summit and backslope

*Slope range:* 3 to 35 percent

*Texture of the surface layer:* Highly organic very cobbly fine sandy loam

*Depth to restrictive feature:* 51 to 102 centimeters to lithic bedrock

*Parent material:* Loamy drift over igneous bedrock

*Drainage class:* Well drained

*Flooding:* None

*Ponding:* None

*Hydric soil status:* No

*Depth to seasonal water table:* More than 200 centimeters

*Available water capacity to a depth of 150 centimeters:* Very low (about 5.2 centimeters)

*Content of organic carbon to a depth of 2 meters:* 4 kg/m<sup>2</sup>

*Taxonomic classification:* Loamy-skeletal, isotic, frigid Typic Dystrudepts

#### **Quetico, bouldery and similar soils**

*Position on the landscape:* Summit, backslope, and shoulder

*Slope range:* 3 to 35 percent

*Texture of the surface layer:* Moderately decomposed plant material

*Depth to restrictive feature:* 10 to 25 centimeters to lithic bedrock

*Parent material:* Loamy drift over igneous bedrock

*Drainage class:* Well drained

*Flooding:* None

*Ponding:* None

*Hydric soil status:* No

*Depth to seasonal water table:* More than 200 centimeters

*Available water capacity to a depth of 150 centimeters:* Very low (about 2.9 centimeters)

*Content of organic carbon to a depth of 2 meters:* 3 kg/m<sup>2</sup>

*Taxonomic classification:* Loamy, isotic, acid, frigid Lithic Udorthents

#### **Wahlsten, bouldery, skeletal and similar soils**

*Position on the landscape:* Summit, shoulder, and backslope

*Slope range:* 0 to 8 percent

*Texture of the surface layer:* Moderately decomposed plant material

*Depth to restrictive feature:* 51 to 102 centimeters to lithic bedrock  
*Parent material:* Coarse-loamy till over igneous bedrock  
*Drainage class:* Moderately well drained  
*Flooding:* None  
*Ponding:* None  
*Hydric soil status:* No  
*Depth to seasonal water table:* 61 centimeters  
*Available water capacity to a depth of 150 centimeters:* Low (about 9.2 centimeters)  
*Content of organic carbon to a depth of 2 meters:* 5 kg/m<sup>2</sup>  
*Taxonomic classification:* Loamy-skeletal, isotic, frigid Oxyaquic Dystrudepts

#### **Rock outcrop**

*Position on the landscape:* Shoulder, backslope, and summit  
*Slope range:* 0 to 60 percent  
*Depth to restrictive feature:* 0 centimeters to lithic bedrock

#### **Aquepts, very rubbly and similar soils**

*Position on the landscape:* Drainageways  
*Slope range:* 0 to 1 percent  
*Texture of the surface layer:* Very stony mucky peat  
*Depth to restrictive feature:* More than 150 centimeters  
*Parent material:* Coarse-loamy till  
*Drainage class:* Very poorly drained  
*Flooding:* None  
*Ponding:* Frequent (see table 21)  
*Hydric soil status:* Yes  
*Depth to seasonal water table:* 0 centimeters  
*Available water capacity to a depth of 150 centimeters:* Low (about 14.4 centimeters)  
*Content of organic carbon to a depth of 2 meters:* 7 kg/m<sup>2</sup>  
*Taxonomic classification:* Loamy-skeletal, nonacid, frigid Typic Endoaquepts

#### **Voyageurs and similar soils**

*Position on the landscape:* Flats  
*Slope range:* 0 to 5 percent  
*Texture of the surface layer:* Highly organic silt loam  
*Depth to restrictive feature:* 120 to 160 centimeters to lithic bedrock  
*Parent material:* Silty glaciolacustrine deposits over water-worked till over igneous bedrock  
*Drainage class:* Somewhat poorly drained  
*Flooding:* None  
*Ponding:* None  
*Hydric soil status:* No  
*Depth to seasonal water table:* 15 centimeters  
*Available water capacity to a depth of 150 centimeters:* Moderate (about 17.3 centimeters)  
*Content of organic carbon to a depth of 2 meters:* 8 kg/m<sup>2</sup>  
*Taxonomic classification:* Fine, smectitic, frigid Aquic Glossudalfs

## **2. Spooner-Sax-Voyageurs** (see figures 18 and 19 at end of section)

*Extent of the map unit within the survey area:* 22 percent  
*Extent of components within the map unit:*  
    Spooner soils—21 percent  
    Sax soils—12 percent

Voyageurs soils—11 percent  
Littleswan soils—9 percent  
Brickton soils—9 percent  
Tacoosh soils—9 percent  
Conic soils—8 percent  
Aquents—7 percent  
Canthook soils—7 percent  
Wahlsten soils—7 percent

### ***Description of Components***

#### **Spooner and similar soils**

*Position on the landscape:* Drainageways and flats  
*Slope range:* 0 to 2 percent  
*Texture of the surface layer:* Mucky silt loam  
*Depth to restrictive feature:* More than 150 centimeters  
*Parent material:* Silty glaciolacustrine deposits  
*Drainage class:* Poorly drained  
*Flooding:* None  
*Ponding:* None  
*Hydric soil status:* Yes  
*Depth to seasonal water table:* 15 centimeters  
*Available water capacity to a depth of 150 centimeters:* Very high (about 31.4 centimeters)  
*Content of organic carbon to a depth of 2 meters:* 17 kg/m<sup>2</sup>  
*Taxonomic classification:* Fine-silty, mixed, superactive, frigid Mollic Endoaqualfs

#### **Sax and similar soils**

*Position on the landscape:* Depressions  
*Slope range:* 0 to 1 percent  
*Texture of the surface layer:* Muck  
*Depth to restrictive feature:* More than 150 centimeters  
*Parent material:* Herbaceous organic material over silty glaciolacustrine deposits  
*Drainage class:* Very poorly drained  
*Flooding:* None  
*Ponding:* Frequent (see table 21)  
*Hydric soil status:* Yes  
*Depth to seasonal water table:* 0 centimeters  
*Available water capacity to a depth of 150 centimeters:* Very high (about 36.2 centimeters)  
*Content of organic carbon to a depth of 2 meters:* 31 kg/m<sup>2</sup>  
*Taxonomic classification:* Fine-silty, mixed, superactive, nonacid, frigid Histic Humaquepts

#### **Voyageurs and similar soils**

*Position on the landscape:* Flats  
*Slope range:* 0 to 5 percent  
*Texture of the surface layer:* Highly organic silt loam  
*Depth to restrictive feature:* 120 to 160 centimeters to lithic bedrock  
*Parent material:* Silty glaciolacustrine deposits over water-worked till over igneous bedrock  
*Drainage class:* Somewhat poorly drained  
*Flooding:* None  
*Ponding:* None

## Soil Survey of Voyageurs National Park, Minnesota

*Hydric soil status:* No

*Depth to seasonal water table:* 15 centimeters

*Available water capacity to a depth of 150 centimeters:* Moderate (about 17.3 centimeters)

*Content of organic carbon to a depth of 2 meters:* 8 kg/m<sup>2</sup>

*Taxonomic classification:* Fine, smectitic, frigid Aquic Glossudalfs

### **Little Swan and similar soils**

*Position on the landscape:* Flats

*Slope range:* 0 to 3 percent

*Texture of the surface layer:* Moderately decomposed plant material

*Depth to restrictive feature:* More than 150 centimeters

*Parent material:* Silty glaciolacustrine deposits

*Drainage class:* Somewhat poorly drained

*Flooding:* None

*Ponding:* None

*Hydric soil status:* No

*Depth to seasonal water table:* 46 centimeters

*Available water capacity to a depth of 150 centimeters:* Very high (about 31.3 centimeters)

*Content of organic carbon to a depth of 2 meters:* 11 kg/m<sup>2</sup>

*Taxonomic classification:* Fine-silty, mixed, superactive, frigid Aquollic Hapludalfs

### **Brickton and similar soils**

*Position on the landscape:* Drainageways and flats

*Slope range:* 0 to 2 percent

*Texture of the surface layer:* Mucky peat

*Depth to restrictive feature:* More than 150 centimeters

*Parent material:* Clayey glaciolacustrine deposits

*Drainage class:* Poorly drained

*Flooding:* None

*Ponding:* None

*Hydric soil status:* Yes

*Depth to seasonal water table:* 0 centimeters

*Available water capacity to a depth of 150 centimeters:* Very high (about 30.1 centimeters)

*Content of organic carbon to a depth of 2 meters:* 19 kg/m<sup>2</sup>

*Taxonomic classification:* Fine, smectitic, frigid Chromic Vertic Albaqualfs

### **Tacoosh, ponded and similar soils**

*Position on the landscape:* Fens

*Slope range:* 0 to 1 percent

*Texture of the surface layer:* Peat

*Depth to restrictive feature:* More than 150 centimeters

*Parent material:* Herbaceous organic material over silty glaciolacustrine deposits

*Drainage class:* Very poorly drained

*Flooding:* None

*Ponding:* Frequent (see table 21)

*Hydric soil status:* Yes

*Depth to seasonal water table:* 0 centimeters

*Available water capacity to a depth of 150 centimeters:* Very high (about 69.7 centimeters)

*Content of organic carbon to a depth of 2 meters:* 92 kg/m<sup>2</sup>

*Taxonomic classification:* Loamy, mixed, euic, frigid Terric Haplohemists

**Conic, very stony, skeletal and similar soils**

*Position on the landscape:* Summit and backslope

*Slope range:* 2 to 12 percent

*Texture of the surface layer:* Highly organic very cobbly fine sandy loam

*Depth to restrictive feature:* 51 to 102 centimeters to lithic bedrock

*Parent material:* Loamy drift over igneous bedrock

*Drainage class:* Well drained

*Flooding:* None

*Ponding:* None

*Hydric soil status:* No

*Depth to seasonal water table:* More than 200 centimeters

*Available water capacity to a depth of 150 centimeters:* Very low (about 5.2 centimeters)

*Content of organic carbon to a depth of 2 meters:* 4 kg/m<sup>2</sup>

*Taxonomic classification:* Loamy-skeletal, isotic, frigid Typic Dystrudepts

**Aquents, ponded and similar soils**

*Position on the landscape:* Ponds

*Slope range:* 0 to 1 percent

*Texture of the surface layer:* Mucky peat

*Depth to restrictive feature:* More than 150 centimeters

*Parent material:* Loamy alluvium

*Drainage class:* Very poorly drained

*Flooding:* None

*Ponding:* Frequent (see table 21)

*Hydric soil status:* Yes

*Depth to seasonal water table:* 0 centimeters

*Available water capacity to a depth of 150 centimeters:* High (about 28.2 centimeters)

*Content of organic carbon to a depth of 2 meters:* 8 kg/m<sup>2</sup>

*Taxonomic classification:* Aquents

**Canthook and similar soils**

*Position on the landscape:* Flats on lake plains

*Slope range:* 0 to 6 percent

*Texture of the surface layer:* Highly decomposed plant material

*Depth to restrictive feature:* More than 150 centimeters

*Parent material:* Sandy glaciolacustrine deposits over silty and clayey glaciolacustrine deposits

*Drainage class:* Somewhat poorly drained

*Flooding:* None

*Ponding:* None

*Hydric soil status:* No

*Depth to seasonal water table:* 15 centimeters

*Available water capacity to a depth of 150 centimeters:* High (about 27.2 centimeters)

*Content of organic carbon to a depth of 2 meters:* 10 kg/m<sup>2</sup>

*Taxonomic classification:* Fine-loamy, mixed, superactive, frigid Aeris Albaqualfs

**Wahlsten, bouldery, skeletal and similar soils**

*Position on the landscape:* Summit, shoulder, and backslope

*Slope range:* 0 to 8 percent

*Texture of the surface layer:* Moderately decomposed plant material

*Depth to restrictive feature:* 51 to 102 centimeters to lithic bedrock

*Parent material:* Coarse-loamy till over igneous bedrock

*Drainage class:* Moderately well drained

*Flooding:* None

*Ponding:* None

*Hydric soil status:* No

*Depth to seasonal water table:* 61 centimeters

*Available water capacity to a depth of 150 centimeters:* Low (about 9.2 centimeters)

*Content of organic carbon to a depth of 2 meters:* 5 kg/m<sup>2</sup>

*Taxonomic classification:* Loamy-skeletal, isotic, frigid Oxyaquic Dystrudepts

### **3. Greenwood-Rifle-Tacoosh** (see figures 20 and 21 at end of section)

*Extent of the map unit within the survey area:* 15 percent

*Extent of components within the map unit:*

Greenwood soils—35 percent

Rifle soils—29 percent

Tacoosh soils—25 percent

Sax soils—8 percent

Bowstring soils—3 percent

#### ***Description of Components***

##### **Greenwood and similar soils**

*Position on the landscape:* Acidic fens

*Slope range:* 0 to 1 percent

*Texture of the surface layer:* Peat

*Depth to restrictive feature:* More than 150 centimeters

*Parent material:* Mossy organic material over herbaceous organic material

*Drainage class:* Very poorly drained

*Flooding:* None

*Ponding:* None

*Hydric soil status:* Yes

*Depth to seasonal water table:* 5 centimeters

*Available water capacity to a depth of 150 centimeters:* Very high (about 78.2 centimeters)

*Content of organic carbon to a depth of 2 meters:* 142 kg/m<sup>2</sup>

*Taxonomic classification:* Dysic, frigid Typic Haplohemists

##### **Rifle and similar soils**

*Position on the landscape:* Fens

*Slope range:* 0 to 1 percent

*Texture of the surface layer:* Peat

*Depth to restrictive feature:* More than 150 centimeters

*Parent material:* Herbaceous organic material

*Drainage class:* Very poorly drained

*Flooding:* None

*Ponding:* Frequent (see table 21)

*Hydric soil status:* Yes

*Depth to seasonal water table:* 0 centimeters

*Available water capacity to a depth of 150 centimeters:* Very high (about 75.5 centimeters)

*Content of organic carbon to a depth of 2 meters:* 159 kg/m<sup>2</sup>

*Taxonomic classification:* Euic, frigid Typic Haplohemists



**Tacoosh, ponded and similar soils**

*Position on the landscape:* Fens

*Slope range:* 0 to 1 percent

*Texture of the surface layer:* Peat

*Depth to restrictive feature:* More than 150 centimeters

*Parent material:* Herbaceous organic material over silty glaciolacustrine deposits

*Drainage class:* Very poorly drained

*Flooding:* None

*Ponding:* Frequent (see table 21)

*Hydric soil status:* Yes

*Depth to seasonal water table:* 0 centimeters

*Available water capacity to a depth of 150 centimeters:* Very high (about 69.7 centimeters)

*Content of organic carbon to a depth of 2 meters:* 92 kg/m<sup>2</sup>

*Taxonomic classification:* Loamy, mixed, euic, frigid Terric Haplohemists

**Sax and similar soils**

*Position on the landscape:* Depressions

*Slope range:* 0 to 1 percent

*Texture of the surface layer:* Muck

*Depth to restrictive feature:* More than 150 centimeters

*Parent material:* Herbaceous organic material over silty glaciolacustrine deposits

*Drainage class:* Very poorly drained

*Flooding:* None

*Ponding:* Frequent (see table 21)

*Hydric soil status:* Yes

*Depth to seasonal water table:* 0 centimeters

*Available water capacity to a depth of 150 centimeters:* Very high (about 36.2 centimeters)

*Content of organic carbon to a depth of 2 meters:* 31 kg/m<sup>2</sup>

*Taxonomic classification:* Fine-silty, mixed, superactive, nonacid, frigid Histic Humaquepts

**Bowstring, frequently flooded and similar soils**

*Position on the landscape:* Drainageways

*Slope range:* 0 to 1 percent

*Texture of the surface layer:* Muck

*Depth to restrictive feature:* More than 150 centimeters

*Parent material:* Stratified loamy herbaceous organic material over loamy alluvium

*Drainage class:* Very poorly drained

*Flooding:* Frequent (see table 21)

*Ponding:* None

*Hydric soil status:* Yes

*Depth to seasonal water table:* 0 centimeters

*Available water capacity to a depth of 150 centimeters:* Very high (about 61.0 centimeters)

*Content of organic carbon to a depth of 2 meters:* 174 kg/m<sup>2</sup>

*Taxonomic classification:* Euic, frigid Fluvaquentic Haplosaprists

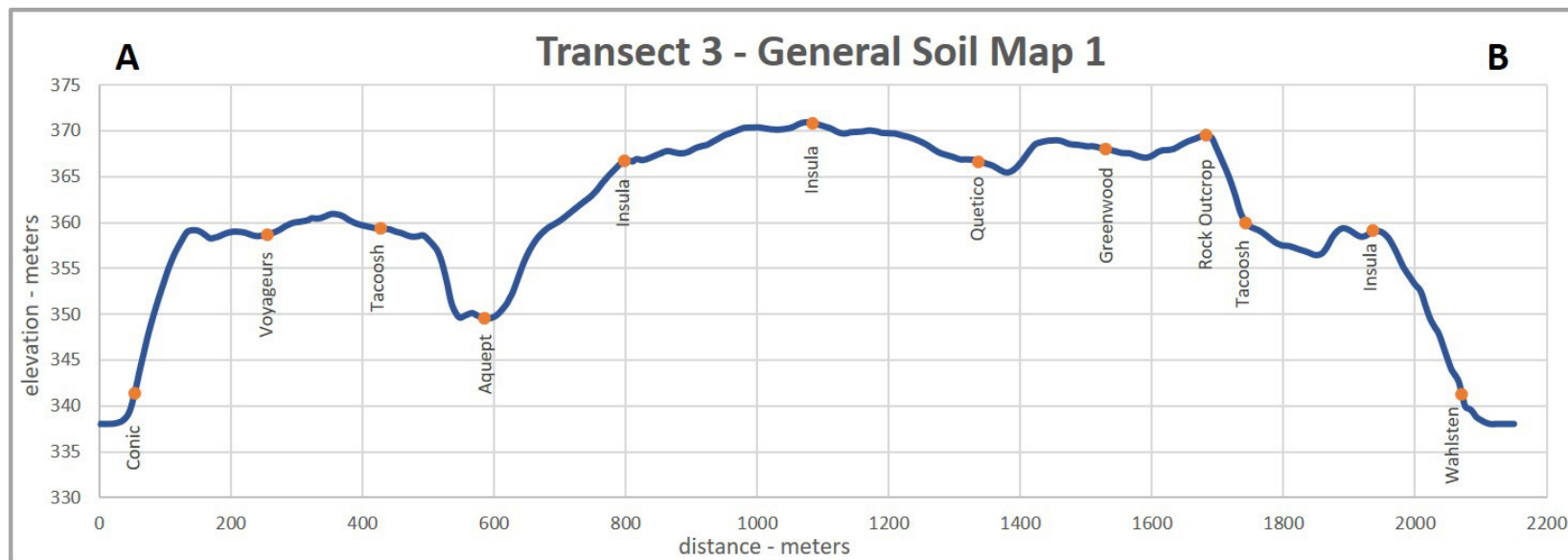


Figure 16.—Elevations of transect 3 in general soil map unit 1.

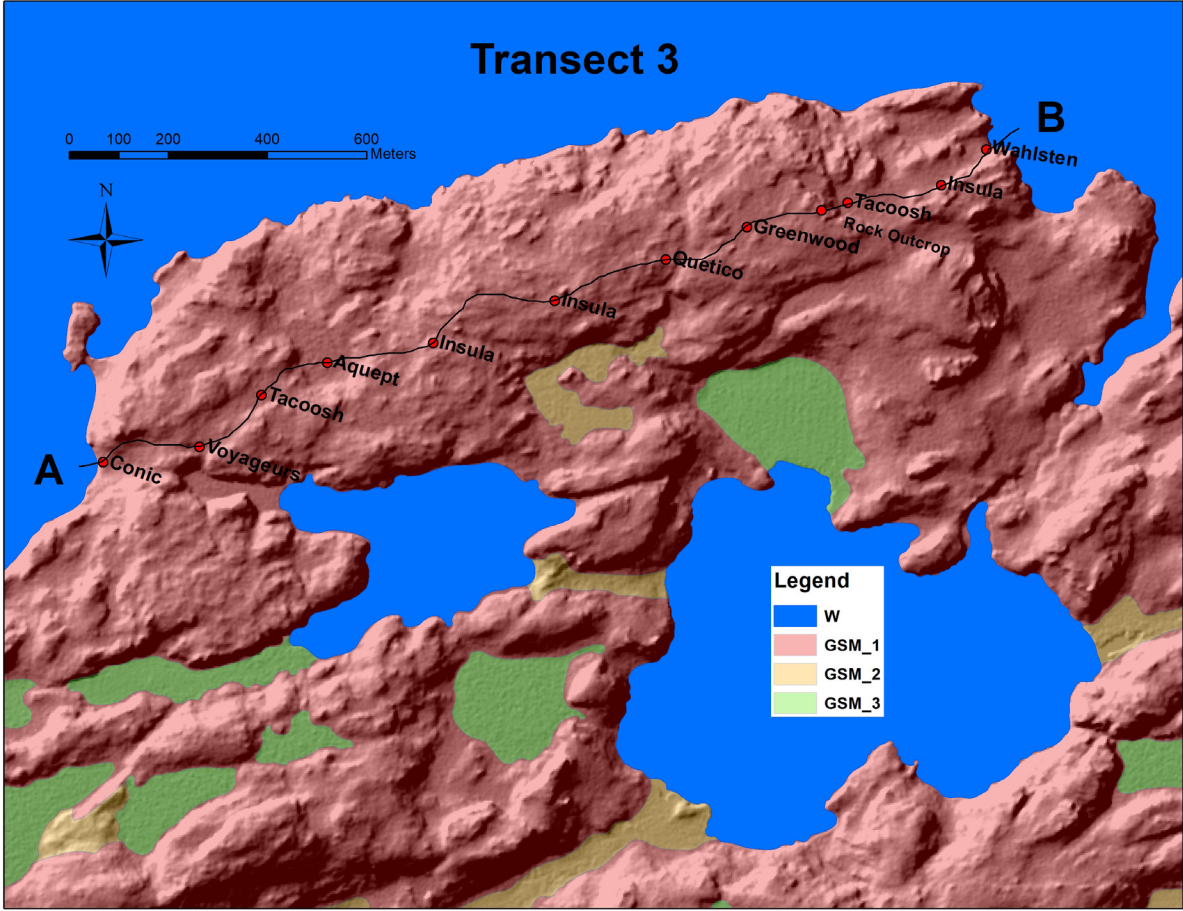


Figure 17.—Transect 3 in general soil map unit 1 shows a rugged landscape with bedrock-controlled topography where lacustrine sediments did not accumulate or were eroded.

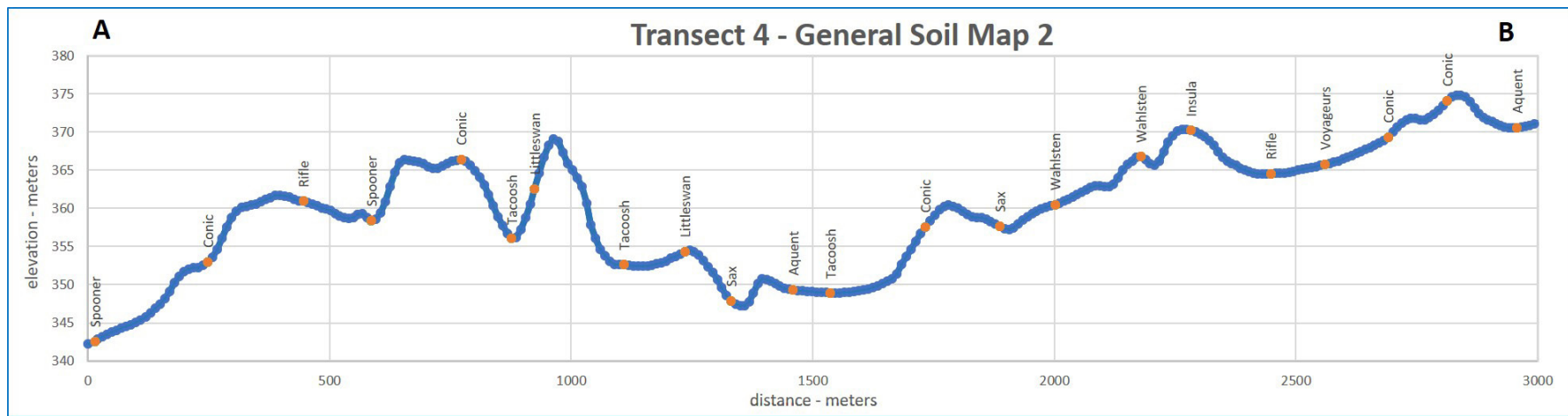


Figure 18.—Elevations of transect 4 in general soil map unit 2.



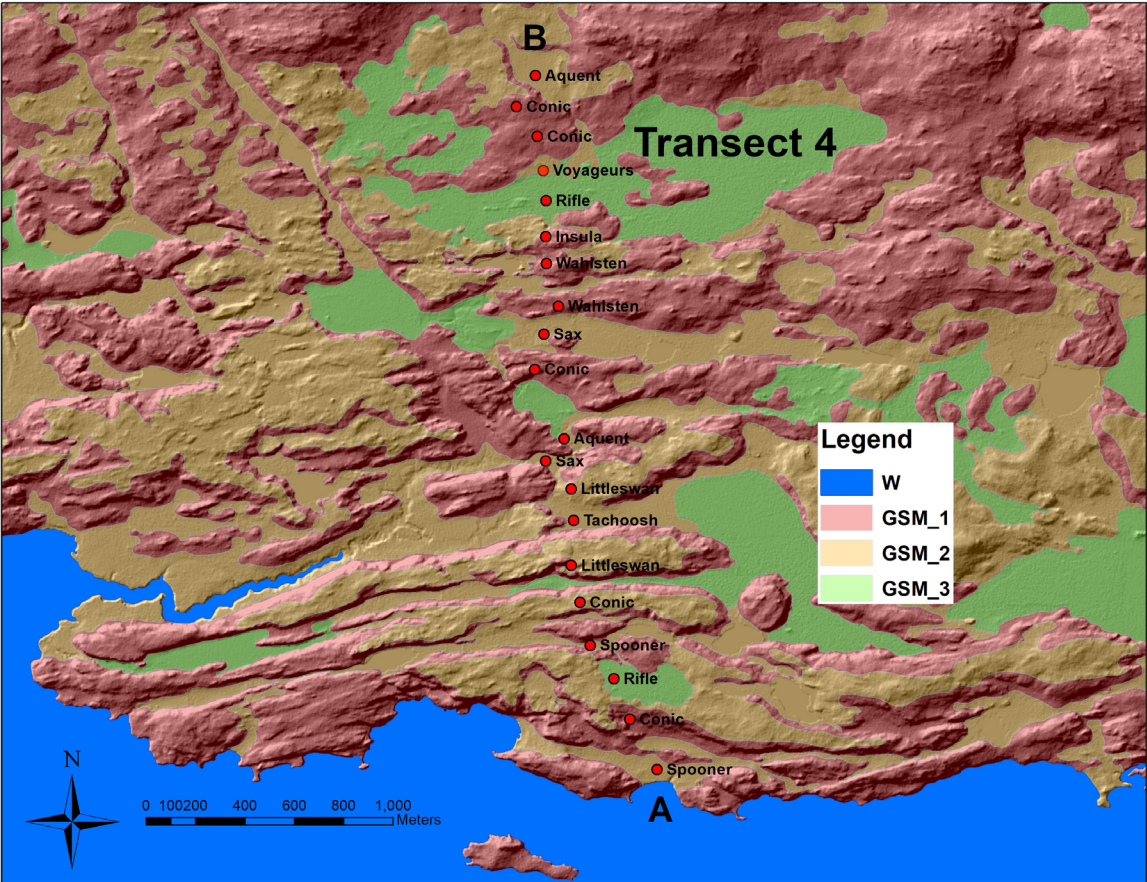


Figure 19.—Transect 4 in general soil map unit 2 shows a complicated pattern of soils associated with lacustrine sediments in the bedrock upland. The lacustrine soils occur in drainageways, on flats, and on footslopes between soils with bedrock substratum on steeper backslopes and shoulders.

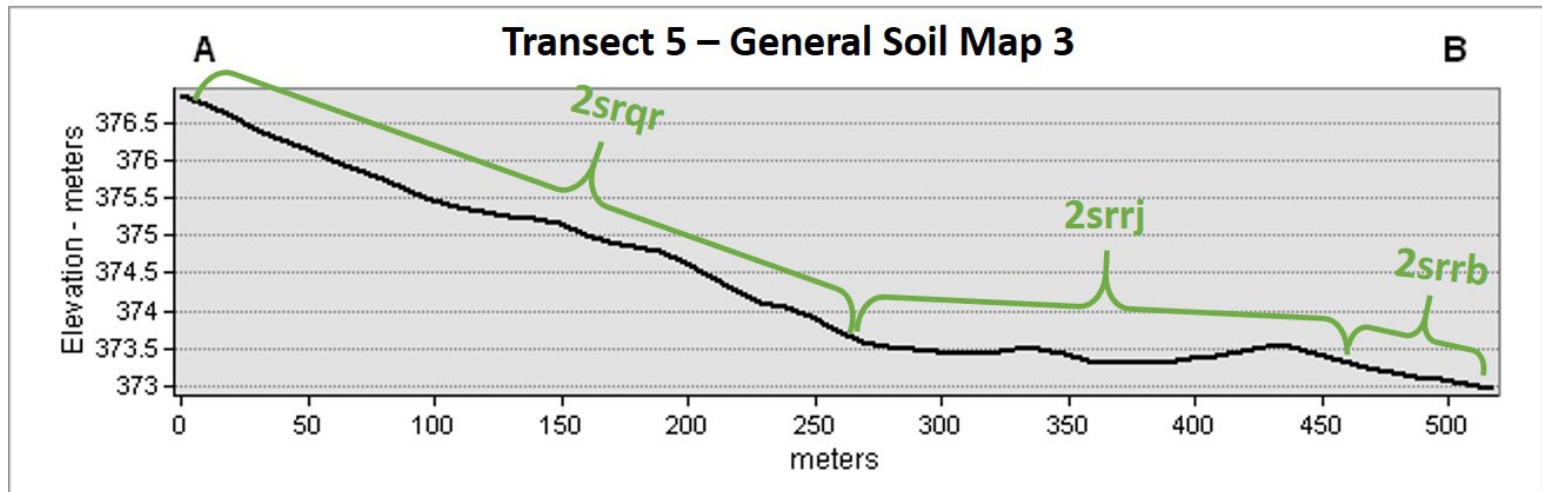


Figure 20.—Elevations of transect 5 in general soil map unit 3.



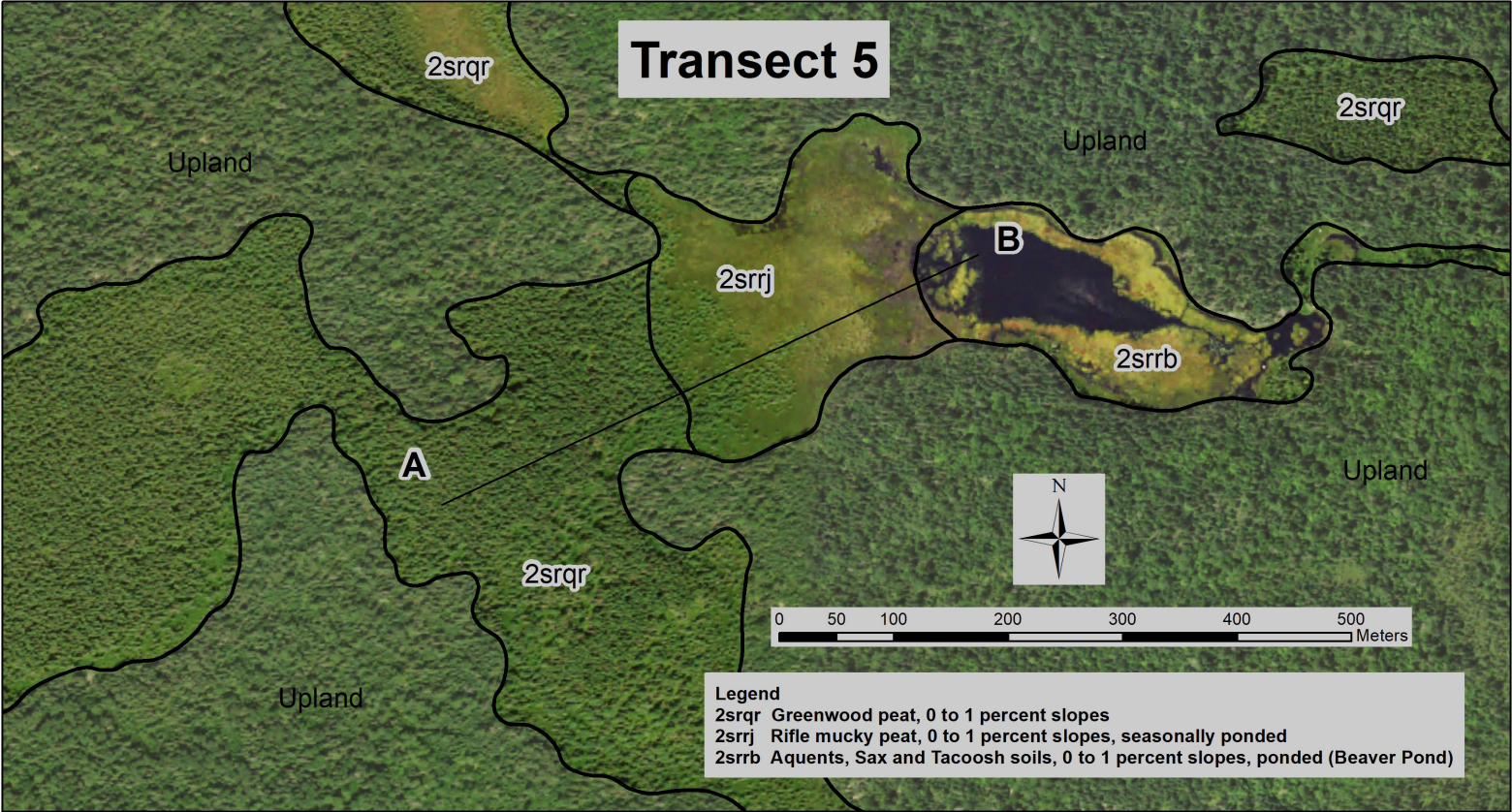


Figure 21.—Transect 5 in general soil map unit 3 shows the change in elevation as one moves up an inland drainageway that has been ponded by a beaver dam, in map unit 2srrb, on the lower end. The aerial image shows the ponded water and the adjacent open marsh, in map unit 2srrj on the Rifle, ponded soil, which also has a perennially high water table that retards tree growth. The elevation is higher across map unit 2srqr where the organic soil has a lower water table and can support tree growth.





# Detailed Soil Map Units

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The map units delineated on the detailed soil maps in this survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that differ in use and management from the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The contrasting components are mentioned in the map unit descriptions. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such

differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Greenwood peat, 0 to 1 percent slopes, is a phase of the Greenwood series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Little Swan-Spooner complex, 0 to 3 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Tacoosh and Sax soils, 0 to 1 percent slopes, occasionally flooded, is an undifferentiated group in this survey area.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. The Rock outcrop component of Quetico-Insula, bouldery, Rock outcrop complex, 8 to 60 percent slopes, is an example.

Table 4 lists each map unit in the park, its major and minor components, and the percentage of each component in the unit.

Table 5 gives the acreage, number of hectares, and proportionate extent of each map unit.

Table 6 displays information related to map unit components in the park. *Slope* is the inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. *Elevation* is the height of an object or area on the earth's surface in reference to a fixed point, such as mean sea level. *MAP* indicates mean annual precipitation. *Landform* is a specific shape of the earth, while *landscape* refers to the broad shape of the earth. *Parent material* is the material in which the soils formed.

Other tables give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

## **2srmd—Quetico-Insula, bouldery-Rock outcrop complex, 3 to 18 percent slopes, LRU 93C**

### ***Map Unit Setting***

*Landscape:* Bedrock uplands

*Major land resource area:* 93—Superior Stony and Rocky Loamy Plains and Hills

*Elevation:* 170.0 to 710 meters

*Mean annual precipitation:* 660 to 960 millimeters

*Mean annual air temperature:* 2 to 5 degrees C

*Frost-free period:* 60 to 140 days

*Farmland classification for map unit:* Not prime farmland

### ***Map Unit Composition***

Quetico and similar soils: 35 percent

Insula and similar soils: 20 percent

Rock outcrop: 15 percent

Dissimilar minor components: 30 percent



Figure 22.—An area of map unit 2srmd—Quetico-Insula, bouldery-Rock outcrop complex, 3 to 18 percent slopes, LRU 93C.

### ***Description of the Quetico Soil***

#### **Setting**

*Landform:* Bedrock-controlled moraines (fig. 22)

*Landform position (two-dimensional):* Summit, backslope, and shoulder

*Landform position (three-dimensional):* Side slope

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Slope range:* 3 to 18 percent

*Parent material:* Coarse-loamy till over igneous bedrock

#### **Properties and Qualities**

*Depth to restrictive feature:* 10 to 25 centimeters to lithic bedrock

*Shrink-swell potential:* Low (about 0.9 LEP)

*Slowest capacity to transmit water ( $K_{sat}$ ):* Moderately high

*Natural drainage class:* Well drained

*Flooding frequency:* None

*Ponding frequency:* None

*Depth to seasonal water table:* Not present within a depth of 160 centimeters

*Available water capacity (entire profile):* Very low (about 2.9 centimeters)

#### **Interpretive Groups**

*Land capability subclass (nonirrigated):* 7s

*Hydric soil status:* No

*Hydrologic soil group:* D

*Taxonomic classification:* Loamy, isotic, acid, frigid Lithic Udorthents

### **Typical Profile**

Oe—0 to 1 centimeter; moderately decomposed plant material

A—1 to 5 centimeters; fine sandy loam

Bw—5 to 20 centimeters; gravelly fine sandy loam

R—20 to 200 centimeters; bedrock

### ***Description of the Insula Soil***

#### **Setting**

*Landform:* Bedrock-controlled moraines

*Landform position (two-dimensional):* Backslope and shoulder

*Landform position (three-dimensional):* Side slope

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Slope range:* 3 to 18 percent

*Parent material:* Coarse-loamy till over igneous bedrock

#### **Properties and Qualities**

*Depth to restrictive feature:* 25 to 50 centimeters to lithic bedrock

*Shrink-swell potential:* Low (about 0.8 LEP)

*Slowest capacity to transmit water ( $K_{sat}$ ):* Moderately high

*Natural drainage class:* Well drained

*Flooding frequency:* None

*Ponding frequency:* None

*Depth to seasonal water table:* Not present within a depth of 160 centimeters

*Available water capacity (entire profile):* Very low (about 3.2 centimeters)

#### **Interpretive Groups**

*Land capability subclass (nonirrigated):* 6s

*Hydric soil status:* No

*Hydrologic soil group:* D

*Taxonomic classification:* Loamy, isotic, frigid Lithic Dystrudepts

### **Typical Profile**

Oe—0 to 4 centimeters; moderately decomposed plant material

A—4 to 10 centimeters; sandy loam

Bw1—10 to 18 centimeters; cobbly sandy loam

Bw2—18 to 29 centimeters; cobbly sandy loam

R—29 to 200 centimeters; bedrock

### ***Description of Rock Outcrop***

#### **Setting**

*Landform:* Hillslopes

*Landform position (two-dimensional):* Shoulder, summit, and backslope

*Landform position (three-dimensional):* Side slope

*Down-slope shape:* Convex

*Across-slope shape:* Convex

*Slope range:* 3 to 18 percent

### ***Minor Components***

#### **Wahlsten soils**

*Percent of map unit:* 10 percent

*Slope:* 1 to 8 percent

*Landform:* Bedrock-controlled moraines

*Depth to restrictive feature:* 51 to 102 centimeters to lithic bedrock



*Natural drainage class:* Moderately well drained

*Hydric soil status:* No

**Conic soils**

*Percent of map unit:* 10 percent

*Slope:* 3 to 18 percent

*Landform:* Bedrock-controlled moraines

*Depth to restrictive feature:* 50 to 75 centimeters to lithic bedrock

*Natural drainage class:* Well drained

*Hydric soil status:* No

**Arcadian soils**

*Percent of map unit:* 10 percent

*Slope:* 3 to 35 percent

*Landform:* Bedrock-controlled moraines

*Depth to restrictive feature:* 25 to 51 centimeters to lithic bedrock

*Natural drainage class:* Well drained

*Hydric soil status:* No

**2srqm—Quetico-Insula, bouldery-Rock outcrop complex,  
8 to 60 percent slopes**

***Map Unit Setting***

*Landscape:* Bedrock uplands

*Major land resource area:* 93—Superior Stony and Rocky Loamy Plains and Hills

*Elevation:* 170.0 to 710 meters

*Mean annual precipitation:* 660 to 960 millimeters

*Mean annual air temperature:* 2 to 5 degrees C

*Frost-free period:* 60 to 140 days

*Farmland classification for map unit:* Not prime farmland

***Map Unit Composition***

Quetico and similar soils: 40 percent

Insula and similar soils: 25 percent

Rock outcrop: 15 percent

Dissimilar minor components: 20 percent

***Description of the Quetico Soil***

**Setting**

*Landform:* Bedrock-controlled moraines

*Landform position (two-dimensional):* Summit, backslope, and shoulder

*Landform position (three-dimensional):* Side slope

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Slope range:* 8 to 35 percent

*Parent material:* Coarse-loamy till over igneous bedrock

**Properties and Qualities**

*Depth to restrictive feature:* 10 to 25 centimeters to lithic bedrock

*Shrink-swell potential:* Low (about 0.9 LEP)

*Slowest capacity to transmit water ( $K_{sat}$ ):* Moderately high

*Natural drainage class:* Well drained

*Flooding frequency:* None

*Ponding frequency:* None

*Depth to seasonal water table:* Not present within a depth of 160 centimeters

*Available water capacity (entire profile):* Very low (about 2.9 centimeters)

**Interpretive Groups**

*Land capability subclass (nonirrigated):* 7s

*Hydric soil status:* No

*Hydrologic soil group:* D

*Taxonomic classification:* Loamy, isotic, acid, frigid Lithic Udorthents

**Typical Profile**

Oe—0 to 1 centimeter; moderately decomposed plant material

A—1 to 5 centimeters; fine sandy loam

Bw—5 to 20 centimeters; gravelly fine sandy loam

R—20 to 200 centimeters; bedrock

***Description of the Insula Soil***

**Setting**

*Landform:* Bedrock-controlled moraines

*Landform position (two-dimensional):* Backslope and shoulder

*Landform position (three-dimensional):* Side slope

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Slope range:* 8 to 35 percent

*Parent material:* Coarse-loamy till over igneous bedrock

**Properties and Qualities**

*Depth to restrictive feature:* 25 to 50 centimeters to lithic bedrock

*Shrink-swell potential:* Low (about 0.8 LEP)

*Slowest capacity to transmit water ( $K_{sat}$ ):* Moderately high

*Natural drainage class:* Well drained

*Flooding frequency:* None

*Ponding frequency:* None

*Depth to seasonal water table:* Not present within a depth of 160 centimeters

*Available water capacity (entire profile):* Very low (about 3.2 centimeters)

**Interpretive Groups**

*Land capability subclass (nonirrigated):* 6s

*Hydric soil status:* No

*Hydrologic soil group:* D

*Taxonomic classification:* Loamy, isotic, frigid Lithic Dystrudepts

**Typical Profile**

Oe—0 to 4 centimeters; moderately decomposed plant material

A—4 to 10 centimeters; sandy loam

Bw1—10 to 18 centimeters; cobbly sandy loam

Bw2—18 to 29 centimeters; cobbly sandy loam

R—29 to 200 centimeters; bedrock

***Description of Rock Outcrop***

**Setting**

*Landform:* Hillslopes

*Landform position (two-dimensional):* Shoulder, summit, and backslope

*Landform position (three-dimensional):* Side slope

*Down-slope shape:* Convex

*Across-slope shape:* Convex

*Slope range:* 8 to 60 percent



Figure 23.—Blueberries in an area of map unit 2srqn—Insula-Conic-Rock outcrop complex, 8 to 25 percent slopes, very bouldery.

### ***Minor Components***

#### **Conic soils**

*Percent of map unit:* 10 percent

*Slope:* 3 to 18 percent

*Landform:* Bedrock-controlled moraines

*Depth to restrictive feature:* 50 to 75 centimeters to lithic bedrock

*Natural drainage class:* Well drained

*Hydric soil status:* No

#### **Arcadian soils**

*Percent of map unit:* 10 percent

*Slope:* 3 to 35 percent

*Landform:* Bedrock-controlled moraines

*Depth to restrictive feature:* 25 to 51 centimeters to lithic bedrock

*Natural drainage class:* Well drained

*Hydric soil status:* No

### **2srqn—Insula-Conic-Rock outcrop complex, 8 to 25 percent slopes, very bouldery**

#### ***Map Unit Setting***

*Landscape:* Bedrock uplands (fig. 23)

*Major land resource area:* 93—Superior Stony and Rocky Loamy Plains and Hills

*Elevation:* 337.0 to 429 meters

*Mean annual precipitation:* 660 to 960 millimeters

*Mean annual air temperature:* 2 to 5 degrees C

*Frost-free period:* 60 to 140 days

*Farmland classification for map unit:* Not prime farmland

### **Map Unit Composition**

Insula and similar soils: 35 percent

Conic and similar soils: 16 percent

Rock outcrop: 15 percent

Dissimilar minor components: 34 percent

### **Description of the Insula Soil**

#### **Setting**

*Landform:* Bedrock-controlled moraines

*Landform position (two-dimensional):* Shoulder and backslope

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Slope range:* 8 to 25 percent

*Parent material:* Coarse-loamy till over igneous rock

#### **Properties and Qualities**

*Depth to restrictive feature:* 25 to 51 centimeters to lithic bedrock

*Shrink-swell potential:* Low (about 0.3 LEP)

*Slowest capacity to transmit water ( $K_{sat}$ ):* High

*Natural drainage class:* Well drained

*Flooding frequency:* None

*Ponding frequency:* None

*Depth to seasonal water table:* Not present within a depth of 160 centimeters

*Available water capacity (entire profile):* Very low (about 4.1 centimeters)

#### **Interpretive Groups**

*Land capability subclass (nonirrigated):* 6e

*Hydric soil status:* No

*Hydrologic soil group:* D

*Taxonomic classification:* Loamy-skeletal, isotic, frigid Lithic Dystrudepts

#### **Typical Profile**

Oe—0 to 10 centimeters; very flaggy moderately decomposed plant material

A—10 to 18 centimeters; very flaggy fine sandy loam

Bw—18 to 40 centimeters; very flaggy fine sandy loam

2R—40 to 200 centimeters; bedrock

### **Description of the Conic Soil**

#### **Setting**

*Landform:* Bedrock-controlled moraines

*Landform position (two-dimensional):* Summit and backslope

*Down-slope shape:* Linear

*Across-slope shape:* Convex

*Slope range:* 8 to 25 percent

*Parent material:* Coarse-loamy till over igneous rock

#### **Properties and Qualities**

*Depth to restrictive feature:* 51 to 102 centimeters to lithic bedrock

*Shrink-swell potential:* Low (about 0.5 LEP)

*Slowest capacity to transmit water ( $K_{sat}$ ):* High



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*Natural drainage class:* Well drained

*Flooding frequency:* None

*Ponding frequency:* None

*Depth to seasonal water table:* Not present within a depth of 160 centimeters

*Available water capacity (entire profile):* Very low (about 5.2 centimeters)

### **Interpretive Groups**

*Land capability subclass (nonirrigated):* 6e

*Hydric soil status:* No

*Hydrologic soil group:* B

*Taxonomic classification:* Loamy-skeletal, isotic, frigid Typic Dystrudepts

### **Typical Profile**

A—0 to 7 centimeters; highly organic very cobbly fine sandy loam

Bw1—7 to 14 centimeters; very cobbly fine sandy loam

Bw2—14 to 26 centimeters; very cobbly fine sandy loam

Bw3—26 to 62 centimeters; very cobbly fine sandy loam

R—62 to 200 centimeters; bedrock

### **Description of Rock Outcrop**

#### **Setting**

*Landform:* Hillslopes

*Landform position (two-dimensional):* Shoulder, summit, and backslope

*Landform position (three-dimensional):* Side slope

*Down-slope shape:* Convex

*Across-slope shape:* Convex

*Slope range:* 8 to 25 percent

### **Minor Components**

#### **Metonga soils**

*Percent of map unit:* 14 percent

*Slope:* 0 to 12 percent

*Landform:* Bedrock-controlled moraines

*Depth to restrictive feature:* 50 to 100 centimeters to lithic bedrock

*Natural drainage class:* Well drained

*Hydric soil status:* No

#### **Quetico soils**

*Percent of map unit:* 10 percent

*Slope:* 8 to 25 percent

*Landform:* Bedrock-controlled moraines

*Depth to restrictive feature:* 10 to 25 centimeters to lithic bedrock

*Natural drainage class:* Well drained

*Hydric soil status:* No

#### **Wahlsten soils**

*Percent of map unit:* 5 percent

*Slope:* 1 to 8 percent

*Landform:* Bedrock-controlled moraines

*Depth to restrictive feature:* 51 to 102 centimeters to lithic bedrock

*Natural drainage class:* Moderately well drained

*Hydric soil status:* No

#### **Voyageurs soils**

*Percent of map unit:* 3 percent

*Slope:* 0 to 3 percent

*Landform:* Flats on lake plains  
*Depth to restrictive feature:* 120 to 160 centimeters to lithic bedrock  
*Natural drainage class:* Somewhat poorly drained  
*Hydric soil status:* No

**Aquepts, loamy-skeletal**

*Percent of map unit:* 2 percent  
*Slope:* 0 to 2 percent  
*Landform:* Drainageways on bedrock-controlled moraines  
*Depth to restrictive feature:* None within a depth of 150 centimeters  
*Natural drainage class:* Very poorly drained  
*Ponding frequency:* Frequent  
*Hydric soil status:* Yes

**2srqp—Quetico-Insula, very bouldery-Greenwood complex, 0 to 12 percent slopes, very rocky**

***Map Unit Setting***

*Landscape:* Bedrock uplands  
*Major land resource area:* 93—Superior Stony and Rocky Loamy Plains and Hills  
*Elevation:* 337.0 to 429 meters  
*Mean annual precipitation:* 660 to 960 millimeters  
*Mean annual air temperature:* 2 to 5 degrees C  
*Frost-free period:* 60 to 140 days  
*Farmland classification for map unit:* Not prime farmland

***Map Unit Composition***

Quetico and similar soils: 31 percent  
Insula and similar soils: 30 percent  
Greenwood and similar soils: 15 percent  
Dissimilar minor components: 24 percent

***Description of the Quetico Soil***

**Setting**

*Landform:* Bedrock-controlled moraines  
*Landform position (two-dimensional):* Summit, shoulder, and backslope  
*Down-slope shape:* Convex  
*Across-slope shape:* Convex  
*Slope range:* 2 to 12 percent  
*Parent material:* Coarse-loamy till over igneous rock

**Properties and Qualities**

*Depth to restrictive feature:* 10 to 25 centimeters to lithic bedrock  
*Shrink-swell potential:* Low (about 0.4 LEP)  
*Slowest capacity to transmit water ( $K_{sat}$ ):* High  
*Natural drainage class:* Well drained  
*Flooding frequency:* None  
*Ponding frequency:* None  
*Depth to seasonal water table:* Not present within a depth of 160 centimeters  
*Available water capacity (entire profile):* Very low (about 1.0 centimeters)

**Interpretive Groups**

*Land capability subclass (nonirrigated):* 7s  
*Hydric soil status:* No

*Hydrologic soil group:* D

*Taxonomic classification:* Loamy-skeletal, isotic, acid, frigid Lithic Udorthents

**Typical Profile**

A—0 to 5 centimeters; highly organic very cobbly fine sandy loam

Bw—5 to 12 centimeters; very cobbly sandy loam

2R—12 to 200 centimeters; bedrock

***Description of the Insula Soil***

**Setting**

*Landform:* Bedrock-controlled moraines

*Landform position (two-dimensional):* Shoulder and backslope

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Slope range:* 2 to 12 percent

*Parent material:* Coarse-loamy till over igneous rock

**Properties and Qualities**

*Depth to restrictive feature:* 25 to 51 centimeters to lithic bedrock

*Shrink-swell potential:* Low (about 0.3 LEP)

*Slowest capacity to transmit water ( $K_{sat}$ ):* High

*Natural drainage class:* Well drained

*Flooding frequency:* None

*Ponding frequency:* None

*Depth to seasonal water table:* Not present within a depth of 160 centimeters

*Available water capacity (entire profile):* Very low (about 4.1 centimeters)

**Interpretive Groups**

*Land capability subclass (nonirrigated):* 6s

*Hydric soil status:* No

*Hydrologic soil group:* D

*Taxonomic classification:* Loamy-skeletal, isotic, frigid Lithic Dystrudepts

**Typical Profile**

Oe—0 to 10 centimeters; very flaggy moderately decomposed plant material

A—10 to 18 centimeters; very flaggy fine sandy loam

Bw—18 to 40 centimeters; very flaggy fine sandy loam

2R—40 to 200 centimeters; bedrock

***Description of the Greenwood Soil***

**Setting**

*Landform:* Bogs on lake plains

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Slope range:* 0 to 1 percent

*Parent material:* Mossy organic material over herbaceous organic material

**Properties and Qualities**

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Shrink-swell potential:* Unspecified

*Slowest capacity to transmit water ( $K_{sat}$ ):* High

*Natural drainage class:* Very poorly drained

*Flooding frequency:* None

*Ponding frequency:* None

*Depth to seasonal water table:* About 15 centimeters (see table 21)

*Available water capacity (entire profile):* Very high (about 102.0 centimeters)

**Interpretive Groups**

*Land capability subclass (nonirrigated):* 7w

*Hydric soil status:* Yes

*Hydrologic soil group:* A/D

*Taxonomic classification:* Dysic, frigid Typic Haplohemists

**Typical Profile**

Oi—0 to 20 centimeters; peat

Oe—20 to 200 centimeters; mucky peat

**Minor Components**

**Rock outcrop**

*Percent of map unit:* 9 percent

*Slope:* 0 to 12 percent

*Landform:* Hillslopes

**Merwin soils**

*Percent of map unit:* 5 percent

*Slope:* 0 to 1 percent

*Landform:* Bogs on lake plains

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Natural drainage class:* Very poorly drained

*Ponding frequency:* Occasional

*Hydric soil status:* Yes

**Aquepts, loamy-skeletal**

*Percent of map unit:* 5 percent

*Slope:* 0 to 2 percent

*Landform:* Drainageways on bedrock-controlled moraines

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Natural drainage class:* Very poorly drained

*Ponding frequency:* Frequent

*Hydric soil status:* Yes

**Wahlsten soils**

*Percent of map unit:* 3 percent

*Slope:* 1 to 8 percent

*Landform:* Bedrock-controlled moraines

*Depth to restrictive feature:* 51 to 102 centimeters to lithic bedrock

*Natural drainage class:* Moderately well drained

*Hydric soil status:* No

**Conic soils**

*Percent of map unit:* 2 percent

*Slope:* 2 to 12 percent

*Landform:* Bedrock-controlled moraines

*Depth to restrictive feature:* 51 to 102 centimeters to lithic bedrock

*Natural drainage class:* Well drained

*Hydric soil status:* No

**2srqr—Greenwood peat, 0 to 1 percent slopes**

**Map Unit Setting**

*Landscape:* Bedrock uplands

*Major land resource area:* 93—Superior Stony and Rocky Loamy Plains and Hills

*Elevation:* 337.0 to 429 meters





**Figure 24.**—An area of map unit 2srqr (Greenwood peat, 0 to 1 percent slopes) with black spruce, leatherleaf, and sphagnum.

*Mean annual precipitation:* 660 to 960 millimeters

*Mean annual air temperature:* 2 to 5 degrees C

*Frost-free period:* 60 to 140 days

*Farmland classification for map unit:* Not prime farmland

#### **Map Unit Composition**

Greenwood and similar soils: 80 percent

Dissimilar minor components: 20 percent

#### **Description of the Greenwood Soil**

##### **Setting**

*Landform:* Bogs on lake plains (fig. 24)

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Slope range:* 0 to 1 percent

*Parent material:* Mossy organic material over herbaceous organic material

##### **Properties and Qualities**

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Shrink-swell potential:* Unspecified

*Slowest capacity to transmit water ( $K_{sat}$ ):* High

*Natural drainage class:* Very poorly drained

*Flooding frequency:* None

*Ponding frequency:* None

*Depth to seasonal water table:* About 5 centimeters (see table 21)

*Available water capacity (entire profile):* Very high (about 102.0 centimeters)



**Interpretive Groups**

*Land capability subclass (nonirrigated): 7w*

*Hydric soil status: Yes*

*Hydrologic soil group: A/D*

*Taxonomic classification: Dysic, frigid Typic Haplohemists*

**Typical Profile**

Oi—0 to 20 centimeters; peat

Oe—20 to 200 centimeters; mucky peat

**Minor Components**

**Merwin soils**

*Percent of map unit: 10 percent*

*Slope: 0 to 1 percent*

*Landform: Bogs on lake plains*

*Depth to restrictive feature: None within a depth of 150 centimeters*

*Natural drainage class: Very poorly drained*

*Ponding frequency: Occasional*

*Hydric soil status: Yes*

**Rifle soils**

*Percent of map unit: 5 percent*

*Slope: 0 to 1 percent*

*Landform: Moat rims on fens on lake plains*

*Depth to restrictive feature: None within a depth of 150 centimeters*

*Natural drainage class: Very poorly drained*

*Ponding frequency: Frequent*

*Hydric soil status: Yes*

**Tacoosh soils**

*Percent of map unit: 5 percent*

*Slope: 0 to 1 percent*

*Landform: Moat rims on fens on lake plains*

*Depth to restrictive feature: None within a depth of 150 centimeters*

*Natural drainage class: Very poorly drained*

*Ponding frequency: Frequent*

*Hydric soil status: Yes*

**2srqs—Insula-Conic-Wahlsten complex, 0 to 12 percent slopes, very stony, very rocky**

**Map Unit Setting**

*Landscape: Bedrock uplands*

*Major land resource area: 93—Superior Stony and Rocky Loamy Plains and Hills*

*Elevation: 337.0 to 429 meters*

*Mean annual precipitation: 660 to 960 millimeters*

*Mean annual air temperature: 2 to 5 degrees C*

*Frost-free period: 60 to 140 days*

*Farmland classification for map unit: Not prime farmland*

**Map Unit Composition**

Insula and similar soils: 30 percent

Conic and similar soils: 16 percent

Wahlsten and similar soils: 15 percent  
Dissimilar minor components: 39 percent

### ***Description of the Insula Soil***

#### **Setting**

*Landform:* Bedrock-controlled moraines  
*Landform position (two-dimensional):* Shoulder and backslope  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Slope range:* 2 to 12 percent  
*Parent material:* Coarse-loamy till over igneous rock

#### **Properties and Qualities**

*Depth to restrictive feature:* 25 to 51 centimeters to lithic bedrock  
*Shrink-swell potential:* Low (about 0.3 LEP)  
*Slowest capacity to transmit water ( $K_{sat}$ ):* High  
*Natural drainage class:* Well drained  
*Flooding frequency:* None  
*Ponding frequency:* None  
*Depth to seasonal water table:* Not present within a depth of 160 centimeters  
*Available water capacity (entire profile):* Very low (about 4.1 centimeters)

#### **Interpretive Groups**

*Land capability subclass (nonirrigated):* 6s  
*Hydric soil status:* No  
*Hydrologic soil group:* D  
*Taxonomic classification:* Loamy-skeletal, isotic, frigid Lithic Dystrudepts

#### **Typical Profile**

Oe—0 to 10 centimeters; very flaggy moderately decomposed plant material  
A—10 to 18 centimeters; very flaggy fine sandy loam  
Bw—18 to 40 centimeters; very flaggy fine sandy loam  
2R—40 to 200 centimeters; bedrock

### ***Description of the Conic Soil***

#### **Setting**

*Landform:* Bedrock-controlled moraines  
*Landform position (two-dimensional):* Summit and backslope  
*Down-slope shape:* Linear  
*Across-slope shape:* Convex  
*Slope range:* 2 to 12 percent  
*Parent material:* Coarse-loamy till over igneous rock

#### **Properties and Qualities**

*Depth to restrictive feature:* 51 to 102 centimeters to lithic bedrock  
*Shrink-swell potential:* Low (about 0.5 LEP)  
*Slowest capacity to transmit water ( $K_{sat}$ ):* High  
*Natural drainage class:* Well drained  
*Flooding frequency:* None  
*Ponding frequency:* None  
*Depth to seasonal water table:* Not present within a depth of 160 centimeters  
*Available water capacity (entire profile):* Very low (about 5.2 centimeters)

#### **Interpretive Groups**

*Land capability subclass (nonirrigated):* 6s  
*Hydric soil status:* No

*Hydrologic soil group:* B

*Taxonomic classification:* Loamy-skeletal, isotic, frigid Typic Dystrudepts

**Typical Profile**

A—0 to 7 centimeters; highly organic very cobbly fine sandy loam

Bw1—7 to 14 centimeters; very cobbly fine sandy loam

Bw2—14 to 26 centimeters; very cobbly fine sandy loam

Bw3—26 to 62 centimeters; very cobbly fine sandy loam

R—62 to 200 centimeters; bedrock

***Description of the Wahlsten Soil***

**Setting**

*Landform:* Bedrock-controlled moraines

*Landform position (two-dimensional):* Summit and footslope

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Slope range:* 1 to 8 percent

*Parent material:* Coarse-loamy till over igneous rock

**Properties and Qualities**

*Depth to restrictive feature:* 51 to 102 centimeters to lithic bedrock

*Shrink-swell potential:* Low (about 0.6 LEP)

*Slowest capacity to transmit water ( $K_{sat}$ ):* Moderately high

*Natural drainage class:* Moderately well drained

*Flooding frequency:* None

*Ponding frequency:* None

*Seasonal water table (depth, kind):* About 61 centimeters; perched (see table 21)

*Available water capacity (entire profile):* Low (about 7.7 centimeters)

**Interpretive Groups**

*Land capability subclass (nonirrigated):* 6s

*Hydric soil status:* No

*Hydrologic soil group:* C

*Taxonomic classification:* Coarse-loamy, isotic, frigid Oxyaquic Dystrudepts

**Typical Profile**

A—0 to 9 centimeters; very cobbly highly organic loam

Bw1—9 to 22 centimeters; cobbly sandy loam

Bw2—22 to 78 centimeters; cobbly sandy loam

R—78 to 200 centimeters; bedrock

***Minor Components***

**Quetico soils**

*Percent of map unit:* 10 percent

*Slope:* 2 to 12 percent

*Landform:* Bedrock-controlled moraines

*Depth to restrictive feature:* 10 to 25 centimeters to lithic bedrock

*Natural drainage class:* Well drained

*Hydric soil status:* No

**Metonga soils**

*Percent of map unit:* 9 percent

*Slope:* 0 to 12 percent

*Landform:* Bedrock-controlled moraines

*Depth to restrictive feature:* 50 to 100 centimeters to lithic bedrock

*Natural drainage class:* Well drained

*Hydric soil status:* No

**Dishno soils**

*Percent of map unit:* 9 percent

*Slope:* 0 to 8 percent

*Landform:* Bedrock-controlled moraines

*Depth to restrictive feature:* 50 to 150 centimeters to lithic bedrock

*Natural drainage class:* Moderately well drained

*Hydric soil status:* No

**Aquepts, loamy-skeletal**

*Percent of map unit:* 3 percent

*Slope:* 0 to 2 percent

*Landform:* Drainageways on bedrock-controlled moraines

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Natural drainage class:* Very poorly drained

*Ponding frequency:* Frequent

*Hydric soil status:* Yes

**Aquepts, fine-loamy**

*Percent of map unit:* 2 percent

*Slope:* 0 to 2 percent

*Landform:* Depressions on lake plains

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Natural drainage class:* Very poorly drained

*Ponding frequency:* Frequent

*Hydric soil status:* Yes

**Voyageurs soils**

*Percent of map unit:* 2 percent

*Slope:* 0 to 5 percent

*Landform:* Flats on lake plains

*Depth to restrictive feature:* 120 to 160 centimeters to lithic bedrock

*Natural drainage class:* Somewhat poorly drained

*Hydric soil status:* No

**Rock outcrop**

*Percent of map unit:* 2 percent

*Slope:* 0 to 12 percent

*Landform:* Hillslopes

**Foglake soils**

*Percent of map unit:* 1 percent

*Slope:* 0 to 2 percent

*Landform:* Flats and drainageways on lake plains

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Natural drainage class:* Poorly drained

*Hydric soil status:* Yes

**Eaglesnest soils**

*Percent of map unit:* 1 percent

*Slope:* 0 to 12 percent

*Landform:* Bedrock-controlled moraines

*Depth to restrictive feature:* 100 to 150 centimeters to densic material

*Natural drainage class:* Moderately well drained

*Hydric soil status:* No



**2srqv—Voyageurs, oxyaquic-Conic, very stony-  
Littleswan complex, 0 to 12 percent slopes, rocky**

***Map Unit Setting***

*Landscape:* Bedrock uplands  
*Major land resource area:* 93—Superior Stony and Rocky Loamy Plains and Hills  
*Elevation:* 337.0 to 429 meters  
*Mean annual precipitation:* 660 to 960 millimeters  
*Mean annual air temperature:* 2 to 5 degrees C  
*Frost-free period:* 60 to 140 days  
*Farmland classification for map unit:* Not prime farmland

***Map Unit Composition***

Voyageurs and similar soils: 35 percent  
Conic and similar soils: 15 percent  
Littleswan and similar soils: 20 percent  
Dissimilar minor components: 30 percent

***Description of the Voyageurs Soil***

**Setting**

*Landform:* Slight rises on lake plains  
*Landform position (three-dimensional):* Rise  
*Down-slope shape:* Linear  
*Across-slope shape:* Convex  
*Slope range:* 0 to 8 percent  
*Parent material:* Silty glaciolacustrine deposits over till over igneous rock

**Properties and Qualities**

*Depth to restrictive feature:* 100 to 160 centimeters to lithic bedrock  
*Shrink-swell potential:* Moderate (about 4.1 LEP)  
*Slowest capacity to transmit water ( $K_{sat}$ ):* Moderately high  
*Natural drainage class:* Moderately well drained  
*Flooding frequency:* None  
*Ponding frequency:* None  
*Seasonal water table (depth, kind):* About 76 centimeters; perched (see table 21)  
*Available water capacity (entire profile):* Moderate (about 17.9 centimeters)

**Interpretive Groups**

*Land capability subclass (nonirrigated):* 2e  
*Hydric soil status:* No  
*Hydrologic soil group:* C  
*Taxonomic classification:* Fine, smectitic, frigid Aquic Glossudalfs

**Typical Profile**

Oe—0 to 5 centimeters; moderately decomposed plant material  
A—5 to 8 centimeters; silt loam  
E/B—8 to 22 centimeters; silt loam  
Bt—22 to 76 centimeters; silty clay loam  
C1—76 to 87 centimeters; stratified silt loam to silty clay loam  
2C2—87 to 101 centimeters; very cobbly coarse sand  
3R—101 to 200 centimeters; bedrock

### ***Description of the Conic Soil***

#### **Setting**

*Landform:* Bedrock-controlled moraines

*Landform position (two-dimensional):* Summit and backslope

*Down-slope shape:* Linear

*Across-slope shape:* Convex

*Slope range:* 2 to 12 percent

*Parent material:* Coarse-loamy till over igneous rock

#### **Properties and Qualities**

*Depth to restrictive feature:* 51 to 102 centimeters to lithic bedrock

*Shrink-swell potential:* Low (about 0.5 LEP)

*Slowest capacity to transmit water ( $K_{sat}$ ):* High

*Natural drainage class:* Well drained

*Flooding frequency:* None

*Ponding frequency:* None

*Depth to seasonal water table:* Not present within a depth of 160 centimeters

*Available water capacity (entire profile):* Very low (about 5.2 centimeters)

#### **Interpretive Groups**

*Land capability subclass (nonirrigated):* 6s

*Hydric soil status:* No

*Hydrologic soil group:* B

*Taxonomic classification:* Loamy-skeletal, isotic, frigid Typic Dystrudepts

#### **Typical Profile**

A—0 to 7 centimeters; highly organic very cobbly fine sandy loam

Bw1—7 to 14 centimeters; very cobbly fine sandy loam

Bw2—14 to 26 centimeters; very cobbly fine sandy loam

Bw3—26 to 62 centimeters; very cobbly fine sandy loam

R—62 to 200 centimeters; bedrock

### ***Description of the Littleswan Soil***

#### **Setting**

*Landform:* Flats on lake plains

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Slope range:* 0 to 4 percent

*Parent material:* Silty glaciolacustrine deposits

#### **Properties and Qualities**

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Shrink-swell potential:* Moderate (about 3.7 LEP)

*Slowest capacity to transmit water ( $K_{sat}$ ):* Moderately high

*Natural drainage class:* Somewhat poorly drained

*Flooding frequency:* None

*Ponding frequency:* None

*Depth to seasonal water table:* About 46 centimeters (see table 21)

*Available water capacity (entire profile):* Very high (about 40.3 centimeters)

#### **Interpretive Groups**

*Land capability subclass (nonirrigated):* 2w

*Hydric soil status:* No

*Hydrologic soil group:* C/D

*Taxonomic classification:* Fine-silty, mixed, superactive, frigid Aquollic Hapludalfs

**Typical Profile**

Oe—0 to 6 centimeters; moderately decomposed plant material

A—6 to 16 centimeters; silt loam

E—16 to 25 centimeters; silt loam

Bt—25 to 63 centimeters; silt loam

Bkg—63 to 100 centimeters; silty clay loam

Cg—100 to 200 centimeters; silty clay loam

**Minor Components**

**Insula soils**

*Percent of map unit:* 10 percent

*Slope:* 2 to 12 percent

*Landform:* Bedrock-controlled moraines

*Depth to restrictive feature:* 25 to 51 centimeters to lithic bedrock

*Natural drainage class:* Well drained

*Hydric soil status:* No

**Wahlsten soils**

*Percent of map unit:* 5 percent

*Slope:* 1 to 8 percent

*Landform:* Bedrock-controlled moraines

*Depth to restrictive feature:* 51 to 102 centimeters to lithic bedrock

*Natural drainage class:* Moderately well drained

*Hydric soil status:* No

**Metonga soils**

*Percent of map unit:* 5 percent

*Slope:* 0 to 12 percent

*Landform:* Bedrock-controlled moraines

*Depth to restrictive feature:* 50 to 100 centimeters to lithic bedrock

*Natural drainage class:* Well drained

*Hydric soil status:* No

**Baudette soils**

*Percent of map unit:* 5 percent

*Slope:* 0 to 6 percent

*Landform:* Slight rises on lake plains

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Natural drainage class:* Moderately well drained

*Hydric soil status:* No

**Aquepts, fine-loamy**

*Percent of map unit:* 4 percent

*Slope:* 0 to 2 percent

*Landform:* Depressions on lake plains

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Natural drainage class:* Very poorly drained

*Ponding frequency:* Frequent

*Hydric soil status:* Yes

**Rock outcrop**

*Percent of map unit:* 1 percent

*Slope:* 0 to 12 percent

*Landform:* Hillslopes

## **2srqw—Wahlsten, very stony-Spooner-Voyageurs complex, 0 to 8 percent slopes, rocky**

### ***Map Unit Setting***

*Landscape:* Bedrock uplands

*Major land resource area:* 93—Superior Stony and Rocky Loamy Plains and Hills

*Elevation:* 337.0 to 429 meters

*Mean annual precipitation:* 660 to 960 millimeters

*Mean annual air temperature:* 2 to 5 degrees C

*Frost-free period:* 60 to 140 days

*Farmland classification for map unit:* Not prime farmland

### ***Map Unit Composition***

Wahlsten and similar soils: 26 percent

Spooner and similar soils: 24 percent

Voyageurs and similar soils: 22 percent

Dissimilar minor components: 28 percent

### ***Description of the Wahlsten Soil***

#### **Setting**

*Landform:* Bedrock-controlled moraines

*Landform position (two-dimensional):* Summit and footslope

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Slope range:* 1 to 8 percent

*Parent material:* Coarse-loamy till over igneous rock

#### **Properties and Qualities**

*Depth to restrictive feature:* 51 to 102 centimeters to lithic bedrock

*Shrink-swell potential:* Low (about 0.6 LEP)

*Slowest capacity to transmit water ( $K_{sat}$ ):* Moderately high

*Natural drainage class:* Moderately well drained

*Flooding frequency:* None

*Ponding frequency:* None

*Seasonal water table (depth, kind):* About 61 centimeters; perched (see table 21)

*Available water capacity (entire profile):* Low (about 7.7 centimeters)

#### **Interpretive Groups**

*Land capability subclass (nonirrigated):* 6s

*Hydric soil status:* No

*Hydrologic soil group:* C

*Taxonomic classification:* Coarse-loamy, isotic, frigid Oxyaquic Dystrudepts

#### **Typical Profile**

A—0 to 9 centimeters; very cobbly highly organic loam

Bw1—9 to 22 centimeters; cobbly sandy loam

Bw2—22 to 78 centimeters; cobbly sandy loam

R—78 to 200 centimeters; bedrock

### ***Description of the Spooner Soil***

#### **Setting**

*Landform:* Flats and drainageways on lake plains

*Down-slope shape:* Linear



*Across-slope shape:* Concave, linear  
*Slope range:* 0 to 2 percent  
*Parent material:* Silty glaciolacustrine deposits

**Properties and Qualities**

*Depth to restrictive feature:* None within a depth of 150 centimeters  
*Shrink-swell potential:* Moderate (about 4.5 LEP)  
*Slowest capacity to transmit water ( $K_{sat}$ ):* Moderately high  
*Natural drainage class:* Poorly drained  
*Flooding frequency:* None  
*Ponding frequency:* None  
*Depth to seasonal water table:* About 15 centimeters (see table 21)  
*Available water capacity (entire profile):* Very high (about 41.4 centimeters)

**Interpretive Groups**

*Land capability subclass (nonirrigated):* 3w  
*Hydric soil status:* Yes  
*Hydrologic soil group:* C/D  
*Taxonomic classification:* Fine-silty, mixed, superactive, frigid Mollic Endoaqualfs

**Typical Profile**

A—0 to 15 centimeters; mucky silt loam  
A/E—15 to 25 centimeters; silt loam  
Eg—25 to 40 centimeters; silty clay loam  
Btg—40 to 70 centimeters; silty clay loam  
Bk—70 to 100 centimeters; silt loam  
C—100 to 200 centimeters; stratified silt loam to silty clay loam

***Description of the Voyageurs Soil***

**Setting**

*Landform:* Flats on lake plains (fig. 25)  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Slope range:* 0 to 5 percent  
*Parent material:* Silty glaciolacustrine deposits over water-worked till over igneous rock

**Properties and Qualities**

*Depth to restrictive feature:* 120 to 160 centimeters to lithic bedrock  
*Shrink-swell potential:* High (about 6.5 LEP)  
*Slowest capacity to transmit water ( $K_{sat}$ ):* Moderately high  
*Natural drainage class:* Somewhat poorly drained  
*Flooding frequency:* None  
*Ponding frequency:* None  
*Seasonal water table (depth, kind):* About 15 centimeters; perched (see table 21)  
*Available water capacity (entire profile):* Moderate (about 17.3 centimeters)

**Interpretive Groups**

*Land capability subclass (nonirrigated):* 2w  
*Hydric soil status:* No  
*Hydrologic soil group:* C/D  
*Taxonomic classification:* Fine, smectitic, frigid Aquic Glossudalfs

**Typical Profile**

A—0 to 7 centimeters; highly organic silt loam  
E—7 to 17 centimeters; silt loam  
E/B—17 to 30 centimeters; silt loam  
Bt—30 to 70 centimeters; silty clay loam



Figure 25.—An area of Voyageurs soil with mixed vegetation, including alder brush, red maple, and aspen.

2C—70 to 140 centimeters; very gravelly loamy sand

3R—140 to 200 centimeters; bedrock

### ***Minor Components***

#### **Insula soils**

*Percent of map unit:* 10 percent

*Slope:* 2 to 8 percent

*Landform:* Bedrock-controlled moraines

*Depth to restrictive feature:* 25 to 51 centimeters to lithic bedrock

*Natural drainage class:* Well drained

*Hydric soil status:* No

#### **Dishno soils**

*Percent of map unit:* 9 percent

*Slope:* 0 to 8 percent

*Landform:* Bedrock-controlled moraines

*Depth to restrictive feature:* 50 to 150 centimeters to lithic bedrock

*Natural drainage class:* Moderately well drained

*Hydric soil status:* No

#### **Aquepts, fine-loamy**

*Percent of map unit:* 3 percent

*Slope:* 0 to 2 percent

*Landform:* Depressions on lake plains

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Natural drainage class:* Very poorly drained

*Ponding frequency:* Frequent

*Hydric soil status:* Yes

**Little Swan soils**

*Percent of map unit:* 3 percent

*Slope:* 0 to 4 percent

*Landform:* Flats on lake plains

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Natural drainage class:* Somewhat poorly drained

*Hydric soil status:* No

**Aquepts, loamy-skeletal**

*Percent of map unit:* 2 percent

*Slope:* 0 to 2 percent

*Landform:* Drainageways on bedrock-controlled moraines

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Natural drainage class:* Very poorly drained

*Ponding frequency:* Frequent

*Hydric soil status:* Yes

**Rock outcrop**

*Percent of map unit:* 1 percent

*Slope:* 0 to 8 percent

*Landform:* Hillslopes

**2srqy—Baudette-Little Swan complex, 0 to 8 percent slopes**

***Map Unit Setting***

*Landscape:* Bedrock uplands

*Major land resource area:* 93—Superior Stony and Rocky Loamy Plains and Hills

*Elevation:* 337.0 to 429 meters

*Mean annual precipitation:* 660 to 960 millimeters

*Mean annual air temperature:* 2 to 5 degrees C

*Frost-free period:* 60 to 140 days

*Farmland classification for map unit:* Not prime farmland

***Map Unit Composition***

Baudette and similar soils: 40 percent

Little Swan and similar soils: 35 percent

Dissimilar minor components: 25 percent

***Description of the Baudette Soil***

**Setting**

*Landform:* Flats and slight rises on lake plains

*Landform position (three-dimensional):* Rise

*Down-slope shape:* Linear

*Across-slope shape:* Convex

*Slope range:* 0 to 8 percent

*Parent material:* Silty glaciolacustrine deposits

**Properties and Qualities**

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Shrink-swell potential:* Moderate (about 4.1 LEP)

*Slowest capacity to transmit water ( $K_{sat}$ ):* Moderately high

*Natural drainage class:* Moderately well drained

*Flooding frequency:* None

*Ponding frequency:* None

*Depth to seasonal water table:* About 76 centimeters (see table 21)

*Available water capacity (entire profile):* Very high (about 40.8 centimeters)

#### **Interpretive Groups**

*Land capability subclass (nonirrigated):* 2e

*Hydric soil status:* No

*Hydrologic soil group:* C

*Taxonomic classification:* Fine-silty, mixed, superactive, frigid Oxyaquic Hapludalfs

#### **Typical Profile**

Oe—0 to 5 centimeters; moderately decomposed plant material

A—5 to 8 centimeters; highly organic silt loam

E—8 to 20 centimeters; silt loam

E/B—20 to 35 centimeters; silt loam

Bt—35 to 70 centimeters; silty clay loam

BC—70 to 90 centimeters; silt loam

C—90 to 200 centimeters; silt loam

### ***Description of the Little Swan Soil***

#### **Setting**

*Landform:* Flats on lake plains

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Slope range:* 0 to 4 percent

*Parent material:* Silty glaciolacustrine deposits

#### **Properties and Qualities**

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Shrink-swell potential:* Moderate (about 3.7 LEP)

*Slowest capacity to transmit water ( $K_{sat}$ ):* Moderately high

*Natural drainage class:* Somewhat poorly drained

*Flooding frequency:* None

*Ponding frequency:* None

*Depth to seasonal water table:* About 46 centimeters (see table 21)

*Available water capacity (entire profile):* Very high (about 40.3 centimeters)

#### **Interpretive Groups**

*Land capability subclass (nonirrigated):* 2w

*Hydric soil status:* No

*Hydrologic soil group:* C/D

*Taxonomic classification:* Fine-silty, mixed, superactive, frigid Aquollic Hapludalfs

#### **Typical Profile**

Oe—0 to 6 centimeters; moderately decomposed plant material

A—6 to 16 centimeters; silt loam

E—16 to 25 centimeters; silt loam

Bt—25 to 63 centimeters; silt loam

Bkg—63 to 100 centimeters; silty clay loam

Cg—100 to 200 centimeters; silty clay loam

### ***Minor Components***

#### **Voyageurs soils**

*Percent of map unit:* 10 percent



*Slope:* 0 to 5 percent

*Landform:* Flats on lake plains

*Depth to restrictive feature:* 120 to 160 centimeters to lithic bedrock

*Natural drainage class:* Somewhat poorly drained

*Hydric soil status:* No

**Wahlsten soils**

*Percent of map unit:* 5 percent

*Slope:* 1 to 8 percent

*Landform:* Bedrock-controlled moraines

*Depth to restrictive feature:* 51 to 102 centimeters to lithic bedrock

*Natural drainage class:* Moderately well drained

*Hydric soil status:* No

**Insula soils**

*Percent of map unit:* 5 percent

*Slope:* 2 to 8 percent

*Landform:* Bedrock-controlled moraines

*Depth to restrictive feature:* 25 to 51 centimeters to lithic bedrock

*Natural drainage class:* Well drained

*Hydric soil status:* No

**Spooner soils**

*Percent of map unit:* 5 percent

*Slope:* 0 to 2 percent

*Landform:* Flats and drainageways on lake plains

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Natural drainage class:* Poorly drained

*Hydric soil status:* Yes

**2srqz—Canthook-Durkeelake complex, 0 to 12 percent slopes**

***Map Unit Setting***

*Landscape:* Bedrock uplands

*Major land resource area:* 93—Superior Stony and Rocky Loamy Plains and Hills

*Elevation:* 337.0 to 429 meters

*Mean annual precipitation:* 660 to 960 millimeters

*Mean annual air temperature:* 2 to 5 degrees C

*Frost-free period:* 60 to 140 days

*Farmland classification for map unit:* Not prime farmland

***Map Unit Composition***

Canthook and similar soils: 30 percent

Durkeelake and similar soils: 30 percent

Dissimilar minor components: 40 percent

***Description of the Canthook Soil***

**Setting**

*Landform:* Flats on lake plains (fig. 26)

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Slope range:* 0 to 6 percent



Figure 26.—An area of the Canthook soil.

*Parent material:* Sandy glaciolacustrine deposits over silty and clayey glaciolacustrine deposits

**Properties and Qualities**

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Shrink-swell potential:* Moderate (about 5.6 LEP)

*Slowest capacity to transmit water ( $K_{sat}$ ):* Moderately low

*Natural drainage class:* Somewhat poorly drained

*Flooding frequency:* None

*Ponding frequency:* None

*Seasonal water table (depth, kind):* About 15 centimeters; perched (see table 21)

*Available water capacity (entire profile):* Very high (about 34.7 centimeters)

**Interpretive Groups**

*Land capability subclass (nonirrigated):* 2w

*Hydric soil status:* No

*Hydrologic soil group:* C/D

*Taxonomic classification:* Fine-loamy, mixed, superactive, frigid Aeric Albaqualfs

**Typical Profile**

Oa—0 to 2 centimeters; highly decomposed plant material

A—2 to 12 centimeters; sandy loam

E—12 to 29 centimeters; loamy sand

2B/E—29 to 43 centimeters; clay loam

2Btg—43 to 61 centimeters; clay loam

2BCg—61 to 91 centimeters; clay loam

2Cg—91 to 200 centimeters; silty clay loam

**Description of the Durkeelake Soil**

**Setting**

*Landform:* Slight rises on lake plains

*Landform position (two-dimensional):* Backslope

*Landform position (three-dimensional):* Rise

*Down-slope shape:* Linear

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*Across-slope shape:* Convex

*Slope range:* 0 to 12 percent

*Parent material:* Sandy glaciolacustrine deposits over silty and clayey glaciolacustrine deposits

### Properties and Qualities

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Shrink-swell potential:* Low (about 2.4 LEP)

*Slowest capacity to transmit water ( $K_{sat}$ ):* Moderately high

*Natural drainage class:* Moderately well drained

*Flooding frequency:* None

*Ponding frequency:* None

*Seasonal water table (depth, kind):* About 60 centimeters; perched (see table 21)

*Available water capacity (entire profile):* Very high (about 34.1 centimeters)

### Interpretive Groups

*Land capability subclass (nonirrigated):* 2e

*Hydric soil status:* No

*Hydrologic soil group:* B

*Taxonomic classification:* Loamy, mixed, active, frigid Oxyaquic Hapludalfs

### Typical Profile

A—0 to 8 centimeters; highly organic sandy loam

Bw1—8 to 18 centimeters; loamy sand

Bw2—18 to 60 centimeters; loamy sand

2Bt—60 to 85 centimeters; stratified silt loam to very fine sandy loam to silty clay loam

2C—85 to 200 centimeters; stratified silty clay loam to silty clay to silt loam

## Minor Components

### Bootleg soils

*Percent of map unit:* 10 percent

*Slope:* 0 to 2 percent

*Landform:* Flats and drainageways on lake plains

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Natural drainage class:* Poorly drained

*Hydric soil status:* Yes

### Udipsamments

*Percent of map unit:* 10 percent

*Slope:* 0 to 12 percent

*Landform:* Hillslopes on lake plains

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Natural drainage class:* Somewhat excessively drained

*Hydric soil status:* No

### Grytal soils

*Percent of map unit:* 10 percent

*Slope:* 0 to 3 percent

*Landform:* Flats on lake plains

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Natural drainage class:* Moderately well drained

*Hydric soil status:* No

### Voyageurs soils

*Percent of map unit:* 5 percent

*Slope:* 0 to 5 percent

*Landform:* Flats on lake plains

*Depth to restrictive feature:* 120 to 160 centimeters to lithic bedrock

*Natural drainage class:* Somewhat poorly drained

*Hydric soil status:* No

**Aquepts, fine-loamy**

*Percent of map unit:* 5 percent

*Slope:* 0 to 2 percent

*Landform:* Depressions on lake plains

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Natural drainage class:* Very poorly drained

*Ponding frequency:* Frequent

*Hydric soil status:* Yes

## **2srr3—Spooner-Sax complex, 0 to 2 percent slopes**

### ***Map Unit Setting***

*Landscape:* Bedrock uplands

*Major land resource area:* 93—Superior Stony and Rocky Loamy Plains and Hills

*Elevation:* 337.0 to 400 meters

*Mean annual precipitation:* 660 to 960 millimeters

*Mean annual air temperature:* 2 to 5 degrees C

*Frost-free period:* 60 to 140 days

*Farmland classification for map unit:* Not prime farmland

### ***Map Unit Composition***

Spooner and similar soils: 40 percent

Sax and similar soils: 35 percent

Dissimilar minor components: 25 percent

### ***Description of the Spooner Soil***

#### **Setting**

*Landform:* Flats and drainageways on lake plains

*Down-slope shape:* Linear

*Across-slope shape:* Concave, linear

*Slope range:* 0 to 2 percent

*Parent material:* Silty glaciolacustrine deposits

#### **Properties and Qualities**

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Shrink-swell potential:* Moderate (about 4.5 LEP)

*Slowest capacity to transmit water ( $K_{sat}$ ):* Moderately high

*Natural drainage class:* Poorly drained

*Flooding frequency:* None

*Ponding frequency:* None

*Depth to seasonal water table:* About 15 centimeters (see table 21)

*Available water capacity (entire profile):* Very high (about 41.4 centimeters)

#### **Interpretive Groups**

*Land capability subclass (nonirrigated):* 3w

*Hydric soil status:* Yes

*Hydrologic soil group:* C/D

*Taxonomic classification:* Fine-silty, mixed, superactive, frigid Mollic Endoaqualfs





Figure 27.—An area of the Sax soil in depressions on lake plains.

#### **Typical Profile**

A—0 to 15 centimeters; mucky silt loam

A/E—15 to 25 centimeters; silt loam

Eg—25 to 40 centimeters; silty clay loam

Btg—40 to 70 centimeters; silty clay loam

Bkg—70 to 100 centimeters; silt loam

C—100 to 200 centimeters; stratified silt loam to silty clay loam

#### ***Description of the Sax Soil***

##### **Setting**

*Landform:* Depressions on lake plains (fig. 27)

*Down-slope shape:* Concave

*Across-slope shape:* Concave

*Slope range:* 0 to 1 percent

*Parent material:* Herbaceous organic material over silty glaciolacustrine deposits

##### **Properties and Qualities**

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Shrink-swell potential:* Low (about 2.4 LEP)

*Slowest capacity to transmit water ( $K_{sat}$ ):* Moderately high

*Natural drainage class:* Very poorly drained

*Flooding frequency:* None

*Ponding frequency:* Frequent (see table 21)

*Depth to seasonal water table:* At the soil surface (see table 21)

*Available water capacity (entire profile):* Very high (about 46.2 centimeters)

**Interpretive Groups**

*Land capability subclass (nonirrigated):* 6w

*Hydric soil status:* Yes

*Hydrologic soil group:* B/D

*Taxonomic classification:* Fine-silty, mixed, superactive, nonacid, frigid Histic  
Humaquepts

**Typical Profile**

Oa—0 to 21 centimeters; muck

A—21 to 31 centimeters; mucky silt loam

Bg—31 to 93 centimeters; silt loam

Cg—93 to 200 centimeters; silt loam

**Minor Components**

**Spooner soils**

*Percent of map unit:* 5 percent

*Slope:* 0 to 3 percent

*Landform:* Flats and drainageways on lake plains

*Depth to restrictive feature:* 102 to 190 centimeters to lithic bedrock

*Natural drainage class:* Poorly drained

*Hydric soil status:* Yes

**Foglake soils**

*Percent of map unit:* 5 percent

*Slope:* 0 to 2 percent

*Landform:* Flats and drainageways on lake plains

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Natural drainage class:* Poorly drained

*Hydric soil status:* Yes

**Littleswan soils**

*Percent of map unit:* 5 percent

*Slope:* 0 to 4 percent

*Landform:* Flats on lake plains

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Natural drainage class:* Somewhat poorly drained

*Hydric soil status:* No

**Bootleg soils**

*Percent of map unit:* 5 percent

*Slope:* 0 to 2 percent

*Landform:* Flats and drainageways on lake plains

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Natural drainage class:* Poorly drained

*Hydric soil status:* Yes

**Canthook soils**

*Percent of map unit:* 5 percent

*Slope:* 0 to 4 percent

*Landform:* Flats on lake plains

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Natural drainage class:* Somewhat poorly drained

*Hydric soil status:* No

## **2srr4—Littleswan-Spooner complex, 0 to 3 percent slopes**

### ***Map Unit Setting***

*Landscape:* Bedrock uplands  
*Major land resource area:* 93—Superior Stony and Rocky Loamy Plains and Hills  
*Elevation:* 337.0 to 400 meters  
*Mean annual precipitation:* 660 to 960 millimeters  
*Mean annual air temperature:* 2 to 5 degrees C  
*Frost-free period:* 60 to 140 days  
*Farmland classification for map unit:* Not prime farmland

### ***Map Unit Composition***

Littleswan and similar soils: 40 percent  
Spooner and similar soils: 25 percent  
Dissimilar minor components: 35 percent

### ***Description of the Littleswan Soil***

#### **Setting**

*Landform:* Flats on lake plains  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Slope range:* 0 to 3 percent  
*Parent material:* Silty glaciolacustrine deposits

#### **Properties and Qualities**

*Depth to restrictive feature:* None within a depth of 150 centimeters  
*Shrink-swell potential:* Moderate (about 3.7 LEP)  
*Slowest capacity to transmit water ( $K_{sat}$ ):* Moderately high  
*Natural drainage class:* Somewhat poorly drained  
*Flooding frequency:* None  
*Ponding frequency:* None  
*Depth to seasonal water table:* About 46 centimeters (see table 21)  
*Available water capacity (entire profile):* Very high (about 40.3 centimeters)

#### **Interpretive Groups**

*Land capability subclass (nonirrigated):* 2w  
*Hydric soil status:* No  
*Hydrologic soil group:* C/D  
*Taxonomic classification:* Fine-silty, mixed, superactive, frigid Aquollic Hapludalfs

#### **Typical Profile**

Oe—0 to 6 centimeters; moderately decomposed plant material  
A—6 to 16 centimeters; silt loam  
E—16 to 25 centimeters; silt loam  
Bt—25 to 63 centimeters; silt loam  
Bkg—63 to 100 centimeters; silty clay loam  
Cg—100 to 200 centimeters; silty clay loam

### ***Description of the Spooner Soil***

#### **Setting**

*Landform:* Flats and drainageways on lake plains  
*Down-slope shape:* Linear  
*Across-slope shape:* Concave, linear

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*Slope range:* 0 to 2 percent

*Parent material:* Silty glaciolacustrine deposits

### Properties and Qualities

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Shrink-swell potential:* Moderate (about 4.5 LEP)

*Slowest capacity to transmit water ( $K_{sat}$ ):* Moderately high

*Natural drainage class:* Poorly drained

*Flooding frequency:* None

*Ponding frequency:* None

*Depth to seasonal water table:* About 15 centimeters (see table 21)

*Available water capacity (entire profile):* Very high (about 41.4 centimeters)

### Interpretive Groups

*Land capability subclass (nonirrigated):* 3w

*Hydric soil status:* Yes

*Hydrologic soil group:* C/D

*Taxonomic classification:* Fine-silty, mixed, superactive, frigid Mollic Endoaqualfs

### Typical Profile

A—0 to 15 centimeters; mucky silt loam

A/E—15 to 25 centimeters; silt loam

Eg—25 to 40 centimeters; silty clay loam

Btg—40 to 70 centimeters; silty clay loam

Bk—70 to 100 centimeters; silt loam

C—100 to 200 centimeters; stratified silt loam to silty clay loam

## Minor Components

### Voyageurs soils

*Percent of map unit:* 10 percent

*Slope:* 0 to 5 percent

*Landform:* Flats on lake plains

*Depth to restrictive feature:* 120 to 160 centimeters to lithic bedrock

*Natural drainage class:* Somewhat poorly drained

*Hydric soil status:* No

### Spooner soils

*Percent of map unit:* 5 percent

*Slope:* 0 to 3 percent

*Landform:* Flats and drainageways on lake plains

*Depth to restrictive feature:* 102 to 190 centimeters to lithic bedrock

*Natural drainage class:* Poorly drained

*Hydric soil status:* Yes

### Sax soils

*Percent of map unit:* 5 percent

*Slope:* 0 to 1 percent

*Landform:* Depressions on lake plains

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Natural drainage class:* Very poorly drained

*Ponding frequency:* Frequent

*Hydric soil status:* Yes

### Foglake soils

*Percent of map unit:* 5 percent

*Slope:* 0 to 2 percent

*Landform:* Flats and drainageways on lake plains



*Depth to restrictive feature:* None within a depth of 150 centimeters

*Natural drainage class:* Poorly drained

*Hydric soil status:* Yes

**Bootleg soils**

*Percent of map unit:* 5 percent

*Slope:* 0 to 2 percent

*Landform:* Flats and drainageways on lake plains

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Natural drainage class:* Poorly drained

*Hydric soil status:* Yes

**Canthook soils**

*Percent of map unit:* 5 percent

*Slope:* 0 to 4 percent

*Landform:* Flats on lake plains

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Natural drainage class:* Somewhat poorly drained

*Hydric soil status:* No

## **2srr7—Mooselake mucky peat, 0 to 1 percent slopes**

### ***Map Unit Setting***

*Landscape:* Bedrock uplands

*Major land resource area:* 93—Superior Stony and Rocky Loamy Plains and Hills

*Elevation:* 337.0 to 429 meters

*Mean annual precipitation:* 660 to 960 millimeters

*Mean annual air temperature:* 2 to 5 degrees C

*Frost-free period:* 60 to 140 days

*Farmland classification for map unit:* Not prime farmland

### ***Map Unit Composition***

Mooselake and similar soils: 80 percent

Dissimilar minor components: 20 percent

### ***Description of the Mooselake Soil***

#### **Setting**

*Landform:* Cedar fens on lake plains

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Slope range:* 0 to 1 percent

*Parent material:* Woody organic material

#### **Properties and Qualities**

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Shrink-swell potential:* Unspecified

*Slowest capacity to transmit water ( $K_{sat}$ ):* High

*Natural drainage class:* Very poorly drained

*Flooding frequency:* None

*Ponding frequency:* Frequent (see table 21)

*Depth to seasonal water table:* At the soil surface (see table 21)

*Available water capacity (entire profile):* Very high (about 100.0 centimeters)



**Interpretive Groups**

*Land capability subclass (nonirrigated): 7w*

*Hydric soil status: Yes*

*Hydrologic soil group: A/D*

*Taxonomic classification: Euic, frigid Typic Haplohemists*

**Typical Profile**

Oe1—0 to 60 centimeters; mucky peat

Oe2—60 to 120 centimeters; mucky peat

Oe3—120 to 200 centimeters; mucky peat

**Minor Components**

**Tacoosh soils**

*Percent of map unit: 10 percent*

*Slope: 0 to 1 percent*

*Landform: Moat rims on fens on lake plains*

*Depth to restrictive feature: None within a depth of 150 centimeters*

*Natural drainage class: Very poorly drained*

*Ponding frequency: Frequent*

*Hydric soil status: Yes*

**Rifle soils**

*Percent of map unit: 5 percent*

*Slope: 0 to 1 percent*

*Landform: Fens on lake plains*

*Depth to restrictive feature: None within a depth of 150 centimeters*

*Natural drainage class: Very poorly drained*

*Ponding frequency: Occasional*

*Hydric soil status: Yes*

**Cathro soils**

*Percent of map unit: 5 percent*

*Slope: 0 to 1 percent*

*Landform: Moat rims on fens on lake plains*

*Depth to restrictive feature: None within a depth of 150 centimeters*

*Natural drainage class: Very poorly drained*

*Ponding frequency: Frequent*

*Hydric soil status: Yes*

**2srr8—Rifle mucky peat, 0 to 1 percent slopes**

**Map Unit Setting**

*Landscape: Bedrock uplands*

*Major land resource area: 93—Superior Stony and Rocky Loamy Plains and Hills*

*Elevation: 337.0 to 429 meters*

*Mean annual precipitation: 660 to 960 millimeters*

*Mean annual air temperature: 2 to 5 degrees C*

*Frost-free period: 60 to 140 days*

*Farmland classification for map unit: Not prime farmland*

**Map Unit Composition**

Rifle and similar soils: 80 percent

Dissimilar minor components: 20 percent

### **Description of the Rifle Soil**

#### **Setting**

*Landform:* Fens on lake plains

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Slope range:* 0 to 1 percent

*Parent material:* Herbaceous organic material

#### **Properties and Qualities**

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Shrink-swell potential:* Unspecified

*Slowest capacity to transmit water ( $K_{sat}$ ):* High

*Natural drainage class:* Very poorly drained

*Flooding frequency:* None

*Ponding frequency:* Occasional (see table 21)

*Depth to seasonal water table:* At the soil surface (see table 21)

*Available water capacity (entire profile):* Very high (about 102.5 centimeters)

#### **Interpretive Groups**

*Land capability subclass (nonirrigated):* 7w

*Hydric soil status:* Yes

*Hydrologic soil group:* A/D

*Taxonomic classification:* Euic, frigid Typic Haplohemists

#### **Typical Profile**

Oi—0 to 25 centimeters; peat

Oe—25 to 200 centimeters; mucky peat

### **Minor Components**

#### **Tacoosh soils**

*Percent of map unit:* 10 percent

*Slope:* 0 to 1 percent

*Landform:* Moat rims on fens on lake plains

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Natural drainage class:* Very poorly drained

*Ponding frequency:* Frequent

*Hydric soil status:* Yes

#### **Greenwood soils**

*Percent of map unit:* 5 percent

*Slope:* 0 to 1 percent

*Landform:* Bogs on lake plains

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Natural drainage class:* Very poorly drained

*Hydric soil status:* Yes

#### **Aquepts, fine-loamy**

*Percent of map unit:* 5 percent

*Slope:* 0 to 2 percent

*Landform:* Depressions on lake plains

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Natural drainage class:* Very poorly drained

*Ponding frequency:* Frequent

*Hydric soil status:* Yes

## **2srr9—Tacoosh and Sax soils, 0 to 1 percent slopes, frequently flooded**

### ***Map Unit Setting***

*Landscape:* Bedrock uplands  
*Major land resource area:* 93—Superior Stony and Rocky Loamy Plains and Hills  
*Elevation:* 337.0 to 429 meters  
*Mean annual precipitation:* 660 to 960 millimeters  
*Mean annual air temperature:* 2 to 5 degrees C  
*Frost-free period:* 60 to 140 days  
*Farmland classification for map unit:* Not prime farmland

### ***Map Unit Composition***

Tacoosh and similar soils: 40 percent  
Sax and similar soils: 35 percent  
Dissimilar minor components: 25 percent

### ***Description of the Tacoosh Soil***

#### **Setting**

*Landform:* Fens on lake plains  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Slope range:* 0 to 1 percent  
*Parent material:* Herbaceous organic material over silty glaciolacustrine deposits

#### **Properties and Qualities**

*Depth to restrictive feature:* None within a depth of 150 centimeters  
*Shrink-swell potential:* Low (about 1.1 LEP)  
*Slowest capacity to transmit water ( $K_{sat}$ ):* Moderately high  
*Natural drainage class:* Very poorly drained  
*Flooding frequency:* Frequent (see table 21)  
*Ponding frequency:* None  
*Depth to seasonal water table:* At the soil surface (see table 21)  
*Available water capacity (entire profile):* Very high (about 76.9 centimeters)

#### **Interpretive Groups**

*Land capability subclass (nonirrigated):* 8w  
*Hydric soil status:* Yes  
*Hydrologic soil group:* A/D  
*Taxonomic classification:* Loamy, mixed, euic, frigid Terric Haplohemists

#### **Typical Profile**

Oi—0 to 25 centimeters; peat  
Oe—25 to 125 centimeters; mucky peat  
A—125 to 135 centimeters; loam  
Cg—135 to 200 centimeters; clay loam

### ***Description of the Sax Soil***

#### **Setting**

*Landform:* Depressions on lake plains  
*Down-slope shape:* Concave

*Across-slope shape:* Concave

*Slope range:* 0 to 1 percent

*Parent material:* Herbaceous organic material over silty glaciolacustrine deposits

**Properties and Qualities**

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Shrink-swell potential:* Low (about 2.4 LEP)

*Slowest capacity to transmit water ( $K_{sat}$ ):* Moderately high

*Natural drainage class:* Very poorly drained

*Flooding frequency:* Frequent (see table 21)

*Ponding frequency:* None

*Depth to seasonal water table:* At the soil surface (see table 21)

*Available water capacity (entire profile):* Very high (about 46.2 centimeters)

**Interpretive Groups**

*Land capability subclass (nonirrigated):* 8w

*Hydric soil status:* Yes

*Hydrologic soil group:* B/D

*Taxonomic classification:* Fine-silty, mixed, superactive, nonacid, frigid Histic  
Humaquepts

**Typical Profile**

Oa—0 to 21 centimeters; muck

A—21 to 31 centimeters; mucky silt loam

Bg—31 to 93 centimeters; silt loam

Cg—93 to 200 centimeters; silt loam

**Minor Components**

**Cathro soils**

*Percent of map unit:* 10 percent

*Slope:* 0 to 1 percent

*Landform:* Depressions and drainageways on lake plains

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Natural drainage class:* Very poorly drained

*Flooding frequency:* Frequent

*Hydric soil status:* Yes

**Rifle soils**

*Percent of map unit:* 10 percent

*Slope:* 0 to 1 percent

*Landform:* Fens on lake plains

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Natural drainage class:* Very poorly drained

*Flooding frequency:* Frequent

*Hydric soil status:* Yes

**Hassman soils**

*Percent of map unit:* 5 percent

*Slope:* 0 to 1 percent

*Landform:* Drainageways on lake plains

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Natural drainage class:* Very poorly drained

*Flooding frequency:* Frequent

*Hydric soil status:* Yes

## **2srrb—Aquents, Sax, and Tacoosh soils, 0 to 1 percent slopes, ponded**

### ***Map Unit Setting***

*Landscape:* Bedrock uplands  
*Major land resource area:* 93—Superior Stony and Rocky Loamy Plains and Hills  
*Elevation:* 337.0 to 429 meters  
*Mean annual precipitation:* 660 to 960 millimeters  
*Mean annual air temperature:* 2 to 5 degrees C  
*Frost-free period:* 60 to 140 days  
*Farmland classification for map unit:* Not prime farmland

### ***Map Unit Composition***

Aquents and similar soils: 30 percent  
Sax and similar soils: 25 percent  
Tacoosh and similar soils: 25 percent  
Dissimilar minor components: 20 percent

### ***Description of Aquents***

#### **Setting**

*Landform:* Ponds on drainageways on lake plains  
*Down-slope shape:* Linear  
*Across-slope shape:* Concave  
*Slope range:* 0 to 1 percent  
*Parent material:* Loamy alluvium

#### **Properties and Qualities**

*Depth to restrictive feature:* None within a depth of 150 centimeters  
*Shrink-swell potential:* Low (about 2.2 LEP)  
*Slowest capacity to transmit water ( $K_{sat}$ ):* Moderately high  
*Natural drainage class:* Very poorly drained  
*Flooding frequency:* None  
*Ponding frequency:* Frequent (see table 21)  
*Depth to seasonal water table:* At the soil surface (see table 21)  
*Available water capacity (entire profile):* Very high (about 36.8 centimeters)

#### **Interpretive Groups**

*Land capability subclass (nonirrigated):* 8w  
*Hydric soil status:* Yes  
*Hydrologic soil group:* B/D  
*Taxonomic classification:* Aquents

#### **Typical Profile**

Oe—0 to 2 centimeters; mucky peat  
A—2 to 6 centimeters; loam  
AC—6 to 25 centimeters; loam  
Cg—25 to 200 centimeters; silt loam

### ***Description of the Sax Soil***

#### **Setting**

*Landform:* Depressions on lake plains  
*Down-slope shape:* Concave  
*Across-slope shape:* Concave



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*Slope range:* 0 to 1 percent

*Parent material:* Herbaceous organic material over silty glaciolacustrine deposits

### Properties and Qualities

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Shrink-swell potential:* Low (about 2.4 LEP)

*Slowest capacity to transmit water ( $K_{sat}$ ):* Moderately high

*Natural drainage class:* Very poorly drained

*Flooding frequency:* None

*Ponding frequency:* Frequent (see table 21)

*Depth to seasonal water table:* At the soil surface (see table 21)

*Available water capacity (entire profile):* Very high (about 46.2 centimeters)

### Interpretive Groups

*Land capability subclass (nonirrigated):* 6w

*Hydric soil status:* Yes

*Hydrologic soil group:* B/D

*Taxonomic classification:* Fine-silty, mixed, superactive, nonacid, frigid Histic Humaquepts

### Typical Profile

Oa—0 to 21 centimeters; muck

A—21 to 31 centimeters; mucky silt loam

Bg—31 to 93 centimeters; silt loam

Cg—93 to 200 centimeters; silt loam

## Description of the Tacoosh Soil

### Setting

*Landform:* Fens on lake plains

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Slope range:* 0 to 1 percent

*Parent material:* Herbaceous organic material over silty glaciolacustrine deposits

### Properties and Qualities

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Shrink-swell potential:* Low (about 1.1 LEP)

*Slowest capacity to transmit water ( $K_{sat}$ ):* Moderately high

*Natural drainage class:* Very poorly drained

*Flooding frequency:* None

*Ponding frequency:* Frequent (see table 21)

*Depth to seasonal water table:* At the soil surface (see table 21)

*Available water capacity (entire profile):* Very high (about 76.9 centimeters)

### Interpretive Groups

*Land capability subclass (nonirrigated):* 8w

*Hydric soil status:* Yes

*Hydrologic soil group:* A/D

*Taxonomic classification:* Loamy, mixed, euic, frigid Terric Haplohemists

### Typical Profile

Oi—0 to 25 centimeters; peat

Oe—25 to 125 centimeters; mucky peat

A—125 to 135 centimeters; loam

Cg—135 to 200 centimeters; clay loam

### ***Minor Components***

#### **Rifle soils**

*Percent of map unit:* 10 percent

*Slope:* 0 to 1 percent

*Landform:* Fens on lake plains

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Natural drainage class:* Very poorly drained

*Ponding frequency:* Frequent

*Hydric soil status:* Yes

#### **Hassman soils**

*Percent of map unit:* 10 percent

*Slope:* 0 to 1 percent

*Landform:* Drainageways on lake plains

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Natural drainage class:* Very poorly drained

*Ponding frequency:* Frequent

*Hydric soil status:* Yes

### **2srrh—Greenwood peat, 0 to 1 percent slopes, seasonally ponded**

#### ***Map Unit Setting***

*Landscape:* Bedrock uplands

*Major land resource area:* 93—Superior Stony and Rocky Loamy Plains and Hills

*Elevation:* 337.0 to 429 meters

*Mean annual precipitation:* 660 to 960 millimeters

*Mean annual air temperature:* 2 to 5 degrees C

*Frost-free period:* 60 to 140 days

*Farmland classification for map unit:* Not prime farmland

#### ***Map Unit Composition***

Greenwood and similar soils: 80 percent

Dissimilar minor components: 20 percent

#### ***Description of the Greenwood Soil***

##### **Setting**

*Landform:* Acidic fens on lake plains

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Slope range:* 0 to 1 percent

*Parent material:* Mossy organic material over herbaceous organic material

##### **Properties and Qualities**

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Shrink-swell potential:* Unspecified

*Slowest capacity to transmit water ( $K_{sat}$ ):* High

*Natural drainage class:* Very poorly drained

*Flooding frequency:* None

*Ponding frequency:* Frequent (see table 21)

*Depth to seasonal water table:* At the soil surface (see table 21)

*Available water capacity (entire profile):* Very high (about 102.0 centimeters)

**Interpretive Groups**

*Land capability subclass (nonirrigated):* 8w

*Hydric soil status:* Yes

*Hydrologic soil group:* A/D

*Taxonomic classification:* Dysic, frigid Typic Haplohemists

**Typical Profile**

Oi—0 to 20 centimeters; peat

Oe—20 to 200 centimeters; mucky peat

***Minor Components***

**Merwin soils**

*Percent of map unit:* 10 percent

*Slope:* 0 to 1 percent

*Landform:* Acidic fens on lake plains

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Natural drainage class:* Very poorly drained

*Ponding frequency:* Frequent

*Hydric soil status:* Yes

**Rifle soils**

*Percent of map unit:* 5 percent

*Slope:* 0 to 1 percent

*Landform:* Fens on lake plains

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Natural drainage class:* Very poorly drained

*Ponding frequency:* Frequent

*Hydric soil status:* Yes

**Tacoosh soils**

*Percent of map unit:* 5 percent

*Slope:* 0 to 1 percent

*Landform:* Fens on lake plains

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Natural drainage class:* Very poorly drained

*Ponding frequency:* Frequent

*Hydric soil status:* Yes

**2srrj—Rifle mucky peat, 0 to 1 percent slopes, seasonally ponded**

***Map Unit Setting***

*Landscape:* Bedrock uplands

*Major land resource area:* 93—Superior Stony and Rocky Loamy Plains and Hills

*Elevation:* 337.0 to 429 meters

*Mean annual precipitation:* 660 to 960 millimeters

*Mean annual air temperature:* 2 to 5 degrees C

*Frost-free period:* 60 to 140 days

*Farmland classification for map unit:* Not prime farmland

***Map Unit Composition***

Rifle and similar soils: 80 percent

Dissimilar minor components: 20 percent

### **Description of the Rifle Soil**

#### **Setting**

*Landform:* Fens on lake plains  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Slope range:* 0 to 1 percent  
*Parent material:* Herbaceous organic material

#### **Properties and Qualities**

*Depth to restrictive feature:* None within a depth of 150 centimeters  
*Shrink-swell potential:* Unspecified  
*Slowest capacity to transmit water ( $K_{sat}$ ):* Moderately high  
*Natural drainage class:* Very poorly drained  
*Flooding frequency:* None  
*Ponding frequency:* Frequent (see table 21)  
*Depth to seasonal water table:* At the soil surface (see table 21)  
*Available water capacity (entire profile):* Very high (about 94.5 centimeters)

#### **Interpretive Groups**

*Land capability subclass (nonirrigated):* 8w  
*Hydric soil status:* Yes  
*Hydrologic soil group:* A/D  
*Taxonomic classification:* Euic, frigid Typic Haplohemists

#### **Typical Profile**

Oi—0 to 5 centimeters; peat  
Oe—5 to 140 centimeters; mucky peat  
Oa—140 to 200 centimeters; muck

### **Minor Components**

#### **Tacoosh soils**

*Percent of map unit:* 10 percent  
*Slope:* 0 to 1 percent  
*Landform:* Fens on lake plains  
*Depth to restrictive feature:* None within a depth of 150 centimeters  
*Natural drainage class:* Very poorly drained  
*Ponding frequency:* Frequent  
*Hydric soil status:* Yes

#### **Greenwood soils**

*Percent of map unit:* 5 percent  
*Slope:* 0 to 1 percent  
*Landform:* Acidic fens on lake plains  
*Depth to restrictive feature:* None within a depth of 150 centimeters  
*Natural drainage class:* Very poorly drained  
*Ponding frequency:* Frequent  
*Hydric soil status:* Yes

#### **Aquepts, fine-loamy**

*Percent of map unit:* 5 percent  
*Slope:* 0 to 2 percent  
*Landform:* Depressions on lake plains  
*Depth to restrictive feature:* None within a depth of 150 centimeters  
*Natural drainage class:* Very poorly drained  
*Ponding frequency:* Frequent  
*Hydric soil status:* Yes

## **2srrk—Insula-Conic-Wahlsten complex, 0 to 25 percent slopes, very stony, very rocky**

### ***Map Unit Setting***

*Landscape:* Bedrock uplands

*Major land resource area:* 93—Superior Stony and Rocky Loamy Plains and Hills

*Elevation:* 337.0 to 429 meters

*Mean annual precipitation:* 660 to 960 millimeters

*Mean annual air temperature:* 2 to 5 degrees C

*Frost-free period:* 60 to 140 days

*Farmland classification for map unit:* Not prime farmland

### ***Map Unit Composition***

Insula and similar soils: 30 percent

Conic and similar soils: 16 percent

Wahlsten and similar soils: 15 percent

Dissimilar minor components: 39 percent

### ***Description of the Insula Soil***

#### **Setting**

*Landform:* Bedrock-controlled moraines

*Landform position (two-dimensional):* Shoulder and backslope

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Slope range:* 2 to 25 percent

*Parent material:* Coarse-loamy till over igneous rock

#### **Properties and Qualities**

*Depth to restrictive feature:* 25 to 51 centimeters to lithic bedrock

*Shrink-swell potential:* Low (about 0.3 LEP)

*Slowest capacity to transmit water ( $K_{sat}$ ):* High

*Natural drainage class:* Well drained

*Flooding frequency:* None

*Ponding frequency:* None

*Depth to seasonal water table:* Not present within a depth of 160 centimeters

*Available water capacity (entire profile):* Very low (about 4.1 centimeters)

#### **Interpretive Groups**

*Land capability subclass (nonirrigated):* 6e

*Hydric soil status:* No

*Hydrologic soil group:* D

*Taxonomic classification:* Loamy-skeletal, isotic, frigid Lithic Dystrudepts

#### **Typical Profile**

Oe—0 to 10 centimeters; very flaggy moderately decomposed plant material

A—10 to 18 centimeters; very flaggy fine sandy loam

Bw—18 to 40 centimeters; very flaggy fine sandy loam

2R—40 to 200 centimeters; bedrock

### ***Description of the Conic Soil***

#### **Setting**

*Landform:* Bedrock-controlled moraines

*Landform position (two-dimensional):* Summit and backslope

*Down-slope shape:* Linear



*Across-slope shape:* Convex  
*Slope range:* 2 to 25 percent  
*Parent material:* Coarse-loamy till over igneous rock

**Properties and Qualities**

*Depth to restrictive feature:* 51 to 102 centimeters to lithic bedrock  
*Shrink-swell potential:* Low (about 0.5 LEP)  
*Slowest capacity to transmit water ( $K_{sat}$ ):* High  
*Natural drainage class:* Well drained  
*Flooding frequency:* None  
*Ponding frequency:* None  
*Depth to seasonal water table:* Not present within a depth of 160 centimeters  
*Available water capacity (entire profile):* Very low (about 5.2 centimeters)

**Interpretive Groups**

*Land capability subclass (nonirrigated):* 6s  
*Hydric soil status:* No  
*Hydrologic soil group:* B  
*Taxonomic classification:* Loamy-skeletal, isotic, frigid Typic Dystrudepts

**Typical Profile**

A—0 to 7 centimeters; highly organic very cobbly fine sandy loam  
Bw1—7 to 14 centimeters; very cobbly fine sandy loam  
Bw2—14 to 26 centimeters; very cobbly fine sandy loam  
Bw3—26 to 62 centimeters; very cobbly fine sandy loam  
R—62 to 200 centimeters; bedrock

***Description of the Wahlsten Soil***

**Setting**

*Landform:* Bedrock-controlled moraines  
*Landform position (two-dimensional):* Summit and footslope  
*Down-slope shape:* Linear  
*Across-slope shape:* Linear  
*Slope range:* 1 to 8 percent  
*Parent material:* Coarse-loamy till over igneous rock

**Properties and Qualities**

*Depth to restrictive feature:* 51 to 102 centimeters to lithic bedrock  
*Shrink-swell potential:* Low (about 0.6 LEP)  
*Slowest capacity to transmit water ( $K_{sat}$ ):* Moderately high  
*Natural drainage class:* Moderately well drained  
*Flooding frequency:* None  
*Ponding frequency:* None  
*Seasonal water table (depth, kind):* About 61 centimeters; perched (see table 21)  
*Available water capacity (entire profile):* Low (about 7.7 centimeters)

**Interpretive Groups**

*Land capability subclass (nonirrigated):* 6s  
*Hydric soil status:* No  
*Hydrologic soil group:* C  
*Taxonomic classification:* Coarse-loamy, isotic, frigid Oxyaquic Dystrudepts

**Typical Profile**

A—0 to 9 centimeters; very cobbly highly organic loam  
Bw1—9 to 22 centimeters; cobbly sandy loam  
Bw2—22 to 78 centimeters; cobbly sandy loam  
R—78 to 200 centimeters; bedrock

### ***Minor Components***

#### **Quetico soils**

*Percent of map unit:* 10 percent

*Slope:* 2 to 25 percent

*Landform:* Bedrock-controlled moraines

*Depth to restrictive feature:* 10 to 25 centimeters to lithic bedrock

*Natural drainage class:* Well drained

*Hydric soil status:* No

#### **Metonga soils**

*Percent of map unit:* 9 percent

*Slope:* 0 to 12 percent

*Landform:* Bedrock-controlled moraines

*Depth to restrictive feature:* 50 to 100 centimeters to lithic bedrock

*Natural drainage class:* Well drained

*Hydric soil status:* No

#### **Dishno soils**

*Percent of map unit:* 9 percent

*Slope:* 0 to 8 percent

*Landform:* Bedrock-controlled moraines

*Depth to restrictive feature:* 50 to 150 centimeters to lithic bedrock

*Natural drainage class:* Moderately well drained

*Hydric soil status:* No

#### **Aquepts, loamy-skeletal**

*Percent of map unit:* 3 percent

*Slope:* 0 to 2 percent

*Landform:* Drainageways on bedrock-controlled moraines

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Natural drainage class:* Very poorly drained

*Ponding frequency:* Frequent

*Hydric soil status:* Yes

#### **Aquepts, fine-loamy**

*Percent of map unit:* 2 percent

*Slope:* 0 to 2 percent

*Landform:* Depressions on lake plains

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Natural drainage class:* Very poorly drained

*Ponding frequency:* Frequent

*Hydric soil status:* Yes

#### **Voyageurs soils**

*Percent of map unit:* 2 percent

*Slope:* 0 to 5 percent

*Landform:* Flats on lake plains

*Depth to restrictive feature:* 120 to 160 centimeters to lithic bedrock

*Natural drainage class:* Somewhat poorly drained

*Hydric soil status:* No

#### **Rock outcrop**

*Percent of map unit:* 2 percent

*Slope:* 0 to 12 percent

*Landform:* Hillslopes

**Foglake soils**

*Percent of map unit:* 1 percent

*Slope:* 0 to 2 percent

*Landform:* Flats and drainageways on lake plains

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Natural drainage class:* Poorly drained

*Hydric soil status:* Yes

**Eaglesnest soils**

*Percent of map unit:* 1 percent

*Slope:* 0 to 12 percent

*Landform:* Bedrock-controlled moraines

*Depth to restrictive feature:* 100 to 152 centimeters to densic material

*Natural drainage class:* Moderately well drained

*Hydric soil status:* No

**2srll—Tacoosh and Sax soils, 0 to 1 percent slopes,  
occasionally flooded**

***Map Unit Setting***

*Landscape:* Bedrock uplands

*Major land resource area:* 93—Superior Stony and Rocky Loamy Plains and Hills

*Elevation:* 337.0 to 429 meters

*Mean annual precipitation:* 660 to 960 millimeters

*Mean annual air temperature:* 2 to 5 degrees C

*Frost-free period:* 60 to 140 days

*Farmland classification for map unit:* Not prime farmland

***Map Unit Composition***

Tacoosh and similar soils: 40 percent

Sax and similar soils: 35 percent

Dissimilar minor components: 25 percent

***Description of the Tacoosh Soil***

**Setting**

*Landform:* Fens on lake plains (fig. 28)

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Slope range:* 0 to 1 percent

*Parent material:* Herbaceous organic material over silty glaciolacustrine deposits

**Properties and Qualities**

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Shrink-swell potential:* Low (about 1.1 LEP)

*Slowest capacity to transmit water ( $K_{sat}$ ):* Moderately high

*Natural drainage class:* Very poorly drained

*Flooding frequency:* Occasional (see table 21)

*Ponding frequency:* None

*Depth to seasonal water table:* At the soil surface (see table 21)

*Available water capacity (entire profile):* Very high (about 76.9 centimeters)

**Interpretive Groups**

*Land capability subclass (nonirrigated):* 7w

*Hydric soil status:* Yes



Figure 28.—A reservoir shoreline on the Tacoosh soil in an area of map unit 2srri with cattail and sedge and very limited tree growth.

*Hydrologic soil group:* A/D

*Taxonomic classification:* Loamy, mixed, euic, frigid Terric Haplohemists

#### **Typical Profile**

Oi—0 to 25 centimeters; peat

Oe—25 to 125 centimeters; mucky peat

A—125 to 135 centimeters; loam

Cg—135 to 200 centimeters; clay loam

#### ***Description of the Sax Soil***

##### **Setting**

*Landform:* Depressions on lake plains

*Down-slope shape:* Concave

*Across-slope shape:* Concave

*Slope range:* 0 to 1 percent

*Parent material:* Herbaceous organic material over silty glaciolacustrine deposits

##### **Properties and Qualities**

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Shrink-swell potential:* Low (about 2.4 LEP)

*Slowest capacity to transmit water ( $K_{sat}$ ):* Moderately high

*Natural drainage class:* Very poorly drained

*Flooding frequency:* Occasional (see table 21)

*Ponding frequency:* None

*Depth to seasonal water table:* At the soil surface (see table 21)

*Available water capacity (entire profile):* Very high (about 46.2 centimeters)

**Interpretive Groups**

*Land capability subclass (nonirrigated): 7w*

*Hydric soil status: Yes*

*Hydrologic soil group: B/D*

*Taxonomic classification: Fine-silty, mixed, superactive, nonacid, frigid Histic  
Humaquepts*

**Typical Profile**

Oa—0 to 21 centimeters; muck

A—21 to 31 centimeters; mucky silt loam

Bg—31 to 93 centimeters; silt loam

Cg—93 to 200 centimeters; silt loam

**Minor Components**

**Cathro soils**

*Percent of map unit: 10 percent*

*Slope: 0 to 1 percent*

*Landform: Depressions and drainageways on lake plains*

*Depth to restrictive feature: None within a depth of 150 centimeters*

*Natural drainage class: Very poorly drained*

*Flooding frequency: Occasional*

*Hydric soil status: Yes*

**Rifle soils**

*Percent of map unit: 10 percent*

*Slope: 0 to 1 percent*

*Landform: Fens on lake plains*

*Depth to restrictive feature: None within a depth of 150 centimeters*

*Natural drainage class: Very poorly drained*

*Flooding frequency: Occasional*

*Hydric soil status: Yes*

**Hassman soils**

*Percent of map unit: 5 percent*

*Slope: 0 to 1 percent*

*Landform: Drainageways on lake plains*

*Depth to restrictive feature: None within a depth of 150 centimeters*

*Natural drainage class: Very poorly drained*

*Flooding frequency: Occasional*

*Hydric soil status: Yes*

**2srrm—Brickton-Hassman complex, 0 to 2 percent slopes**

**Map Unit Setting**

*Landscape: Bedrock uplands*

*Major land resource area: 93—Superior Stony and Rocky Loamy Plains and Hills*

*Elevation: 337.0 to 429 meters*

*Mean annual precipitation: 660 to 960 millimeters*

*Mean annual air temperature: 2 to 5 degrees C*

*Frost-free period: 60 to 140 days*

*Farmland classification for map unit: Not prime farmland*

**Map Unit Composition**

Brickton and similar soils: 40 percent



Hassman and similar soils: 35 percent  
Dissimilar minor components: 25 percent

### ***Description of the Brickton Soil***

#### **Setting**

*Landform:* Flats and drainageways on lake plains  
*Down-slope shape:* Linear  
*Across-slope shape:* Concave, linear  
*Slope range:* 0 to 2 percent  
*Parent material:* Clayey glaciolacustrine deposits

#### **Properties and Qualities**

*Depth to restrictive feature:* None within a depth of 150 centimeters  
*Shrink-swell potential:* High (about 8.1 LEP)  
*Slowest capacity to transmit water ( $K_{sat}$ ):* Moderately low  
*Natural drainage class:* Poorly drained  
*Flooding frequency:* None  
*Ponding frequency:* None  
*Depth to seasonal water table:* At the soil surface (see table 21)  
*Available water capacity (entire profile):* Very high (about 35.3 centimeters)

#### **Interpretive Groups**

*Land capability subclass (nonirrigated):* 3w  
*Hydric soil status:* Yes  
*Hydrologic soil group:* C/D  
*Taxonomic classification:* Fine, smectitic, frigid Chromic Vertic Albaqualfs

#### **Typical Profile**

Oe—0 to 13 centimeters; mucky peat  
A—13 to 20 centimeters; silt loam  
Eg—20 to 38 centimeters; silt loam  
Btg—38 to 125 centimeters; silty clay loam  
Bkg—125 to 155 centimeters; silty clay  
Cg—155 to 200 centimeters; silty clay

### ***Description of the Hassman Soil***

#### **Setting**

*Landform:* Depressions on lake plains (fig. 29)  
*Down-slope shape:* Concave  
*Across-slope shape:* Concave  
*Slope range:* 0 to 1 percent  
*Parent material:* Clayey glaciolacustrine deposits

#### **Properties and Qualities**

*Depth to restrictive feature:* None within a depth of 150 centimeters  
*Shrink-swell potential:* High (about 7.2 LEP)  
*Slowest capacity to transmit water ( $K_{sat}$ ):* Moderately low  
*Natural drainage class:* Very poorly drained  
*Flooding frequency:* None  
*Ponding frequency:* Frequent (see table 21)  
*Depth to seasonal water table:* At the soil surface (see table 21)  
*Available water capacity (entire profile):* Very high (about 32.7 centimeters)

#### **Interpretive Groups**

*Land capability subclass (nonirrigated):* 6w  
*Hydric soil status:* Yes



Figure 29.—An area of the hydric Hassman soil.

*Hydrologic soil group:* C/D

*Taxonomic classification:* Fine, smectitic, nonacid, frigid Vertic Endoaquepts

**Typical Profile**

A—0 to 19 centimeters; mucky loam

AB—19 to 27 centimeters; silty clay loam

Bg1—27 to 46 centimeters; silty clay loam

Bg2—46 to 74 centimeters; silty clay loam

BCg—74 to 152 centimeters; silty clay loam

Cg—152 to 200 centimeters; stratified silty clay loam to silt loam

**Minor Components**

**Spooner soils**

*Percent of map unit:* 5 percent

*Slope:* 0 to 3 percent

*Landform:* Flats and drainageways on lake plains

*Depth to restrictive feature:* 102 to 190 centimeters to lithic bedrock

*Natural drainage class:* Poorly drained

*Hydric soil status:* Yes

**Foglake soils**

*Percent of map unit:* 5 percent

*Slope:* 0 to 2 percent

*Landform:* Flats and drainageways on lake plains

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Natural drainage class:* Poorly drained

*Hydric soil status:* Yes

**Dalbo soils**

*Percent of map unit:* 5 percent

*Slope:* 0 to 3 percent

*Landform:* Flats on lake plains

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Natural drainage class:* Somewhat poorly drained

*Hydric soil status:* No

**Bootleg soils**

*Percent of map unit:* 5 percent

*Slope:* 0 to 2 percent

*Landform:* Flats and drainageways on lake plains

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Natural drainage class:* Poorly drained

*Hydric soil status:* Yes

**Tacoosh soils**

*Percent of map unit:* 5 percent

*Slope:* 0 to 1 percent

*Landform:* Fens on lake plains

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Natural drainage class:* Very poorly drained

*Ponding frequency:* Frequent

*Hydric soil status:* Yes

**2srrn—Brickton-Dalbo complex, 0 to 3 percent slopes**

***Map Unit Setting***

*Landscape:* Bedrock uplands

*Major land resource area:* 93—Superior Stony and Rocky Loamy Plains and Hills

*Elevation:* 337.0 to 400 meters

*Mean annual precipitation:* 660 to 960 millimeters

*Mean annual air temperature:* 2 to 5 degrees C

*Frost-free period:* 60 to 140 days

*Farmland classification for map unit:* Not prime farmland

***Map Unit Composition***

Brickton and similar soils: 60 percent

Dalbo and similar soils: 15 percent

Dissimilar minor components: 25 percent

***Description of the Brickton Soil***

**Setting**

*Landform:* Flats and drainageways on lake plains

*Down-slope shape:* Linear

*Across-slope shape:* Concave, linear

*Slope range:* 0 to 2 percent

*Parent material:* Clayey glaciolacustrine deposits

**Properties and Qualities**

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Shrink-swell potential:* High (about 8.1 LEP)

*Slowest capacity to transmit water ( $K_{sat}$ ):* Moderately low

*Natural drainage class:* Poorly drained

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*Flooding frequency:* None

*Ponding frequency:* None

*Depth to seasonal water table:* At the soil surface (see table 21)

*Available water capacity (entire profile):* Very high (about 35.3 centimeters)

### **Interpretive Groups**

*Land capability subclass (nonirrigated):* 3w

*Hydric soil status:* Yes

*Hydrologic soil group:* C/D

*Taxonomic classification:* Fine, smectitic, frigid Chromic Vertic Albaqualfs

### **Typical Profile**

Oe—0 to 13 centimeters; mucky peat

A—13 to 20 centimeters; silt loam

Eg—20 to 38 centimeters; silt loam

Btg—38 to 125 centimeters; silty clay loam

Bkg—125 to 155 centimeters; silty clay

Cg—155 to 200 centimeters; silty clay

## ***Description of the Dalbo Soil***

### **Setting**

*Landform:* Flats on lake plains

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Slope range:* 0 to 3 percent

*Parent material:* Clayey glaciolacustrine deposits

### **Properties and Qualities**

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Shrink-swell potential:* High (about 8.3 LEP)

*Slowest capacity to transmit water ( $K_{sat}$ ):* Moderately low

*Natural drainage class:* Somewhat poorly drained

*Flooding frequency:* None

*Ponding frequency:* None

*Seasonal water table (depth, kind):* About 15 centimeters; perched (see table 21)

*Available water capacity (entire profile):* High (about 27.8 centimeters)

### **Interpretive Groups**

*Land capability subclass (nonirrigated):* 2w

*Hydric soil status:* No

*Hydrologic soil group:* C/D

*Taxonomic classification:* Fine, smectitic, frigid Oxyaquic Vertic Hapludalfs

### **Typical Profile**

A—0 to 18 centimeters; silt loam

E—18 to 38 centimeters; silt loam

Bt1—38 to 69 centimeters; silty clay

Bt2—69 to 85 centimeters; silty clay

Bk—85 to 118 centimeters; silty clay loam

C—118 to 200 centimeters; silty clay

## ***Minor Components***

### **Voyageurs soils**

*Percent of map unit:* 5 percent

*Slope:* 0 to 5 percent

*Landform:* Flats on lake plains



*Depth to restrictive feature:* 120 to 160 centimeters to lithic bedrock

*Natural drainage class:* Somewhat poorly drained

*Hydric soil status:* No

**Foglake soils**

*Percent of map unit:* 5 percent

*Slope:* 0 to 2 percent

*Landform:* Flats and drainageways on lake plains

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Natural drainage class:* Poorly drained

*Hydric soil status:* Yes

**Spooner soils**

*Percent of map unit:* 5 percent

*Slope:* 0 to 3 percent

*Landform:* Flats and drainageways on lake plains

*Depth to restrictive feature:* 102 to 190 centimeters to lithic bedrock

*Natural drainage class:* Poorly drained

*Hydric soil status:* Yes

**Bootleg soils**

*Percent of map unit:* 5 percent

*Slope:* 0 to 2 percent

*Landform:* Flats and drainageways on lake plains

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Natural drainage class:* Poorly drained

*Hydric soil status:* Yes

**Hassman soils**

*Percent of map unit:* 5 percent

*Slope:* 0 to 1 percent

*Landform:* Depressions on lake plains

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Natural drainage class:* Very poorly drained

*Ponding frequency:* Frequent

*Hydric soil status:* Yes

**2srrq—Cathro and Tacoosh soils, 0 to 1 percent slopes,  
ponded**

***Map Unit Setting***

*Landscape:* Bedrock uplands

*Major land resource area:* 93—Superior Stony and Rocky Loamy Plains and Hills

*Elevation:* 337.0 to 429 meters

*Mean annual precipitation:* 660 to 960 millimeters

*Mean annual air temperature:* 2 to 5 degrees C

*Frost-free period:* 60 to 140 days

*Farmland classification for map unit:* Not prime farmland

***Map Unit Composition***

Cathro and similar soils: 60 percent

Tacoosh and similar soils: 30 percent

Dissimilar minor components: 10 percent



### ***Description of the Cathro Soil***

#### **Setting**

*Landform:* Depressions and drainageways on lake plains

*Down-slope shape:* Concave, linear

*Across-slope shape:* Concave

*Slope range:* 0 to 1 percent

*Parent material:* Organic material over loamy drift

#### **Properties and Qualities**

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Shrink-swell potential:* Low (about 2.8 LEP)

*Slowest capacity to transmit water ( $K_{sat}$ ):* Moderately high

*Natural drainage class:* Very poorly drained

*Flooding frequency:* None

*Ponding frequency:* Frequent (see table 21)

*Depth to seasonal water table:* At the soil surface (see table 21)

*Available water capacity (entire profile):* Very high (about 41.6 centimeters)

#### **Interpretive Groups**

*Land capability subclass (nonirrigated):* 8w

*Hydric soil status:* Yes

*Hydrologic soil group:* C/D

*Taxonomic classification:* Loamy, mixed, euic, frigid Terric Haplosaprists

#### **Typical Profile**

Oe—0 to 14 centimeters; mucky peat

Oa—14 to 42 centimeters; muck

A1—42 to 48 centimeters; mucky silt loam

A2—48 to 62 centimeters; clay loam

Cg—62 to 200 centimeters; clay loam

### ***Description of the Tacoosh Soil***

#### **Setting**

*Landform:* Fens on lake plains

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Slope range:* 0 to 1 percent

*Parent material:* Herbaceous organic material over silty glaciolacustrine deposits

#### **Properties and Qualities**

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Shrink-swell potential:* Low (about 1.1 LEP)

*Slowest capacity to transmit water ( $K_{sat}$ ):* Moderately high

*Natural drainage class:* Very poorly drained

*Flooding frequency:* None

*Ponding frequency:* Frequent (see table 21)

*Depth to seasonal water table:* At the soil surface (see table 21)

*Available water capacity (entire profile):* Very high (about 76.9 centimeters)

#### **Interpretive Groups**

*Land capability subclass (nonirrigated):* 8w

*Hydric soil status:* Yes

*Hydrologic soil group:* A/D

*Taxonomic classification:* Loamy, mixed, euic, frigid Terric Haplohemists

**Typical Profile**

Oi—0 to 25 centimeters; peat

Oe—25 to 125 centimeters; mucky peat

A—125 to 135 centimeters; loam

Cg—135 to 200 centimeters; clay loam

**Minor Components**

**Sax soils**

*Percent of map unit:* 5 percent

*Slope:* 0 to 1 percent

*Landform:* Depressions on lake plains

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Natural drainage class:* Very poorly drained

*Ponding frequency:* Frequent

*Hydric soil status:* Yes

**Aquepts, fine-loamy**

*Percent of map unit:* 5 percent

*Slope:* 0 to 2 percent

*Landform:* Depressions on lake plains

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Natural drainage class:* Very poorly drained

*Ponding frequency:* Frequent

*Hydric soil status:* Yes

**2srrr—Insula, very stony-Voyageurs-Wahlsten, very stony complex, 0 to 12 percent slopes, very rocky**

**Map Unit Setting**

*Landscape:* Bedrock uplands

*Major land resource area:* 93—Superior Stony and Rocky Loamy Plains and Hills

*Elevation:* 337.0 to 429 meters

*Mean annual precipitation:* 660 to 960 millimeters

*Mean annual air temperature:* 2 to 5 degrees C

*Frost-free period:* 60 to 140 days

*Farmland classification for map unit:* Not prime farmland

**Map Unit Composition**

Insula and similar soils: 30 percent

Voyageurs and similar soils: 20 percent

Wahlsten and similar soils: 15 percent

Dissimilar minor components: 35 percent

**Description of the Insula Soil**

**Setting**

*Landform:* Bedrock-controlled moraines

*Landform position (two-dimensional):* Shoulder and backslope

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Slope range:* 2 to 12 percent

*Parent material:* Coarse-loamy till over igneous rock

### Properties and Qualities

*Depth to restrictive feature:* 25 to 51 centimeters to lithic bedrock

*Shrink-swell potential:* Low (about 0.3 LEP)

*Slowest capacity to transmit water ( $K_{sat}$ ):* High

*Natural drainage class:* Well drained

*Flooding frequency:* None

*Ponding frequency:* None

*Depth to seasonal water table:* Not present within a depth of 160 centimeters

*Available water capacity (entire profile):* Very low (about 4.1 centimeters)

### Interpretive Groups

*Land capability subclass (nonirrigated):* 6s

*Hydric soil status:* No

*Hydrologic soil group:* D

*Taxonomic classification:* Loamy-skeletal, isotic, frigid Lithic Dystrudepts

### Typical Profile

Oe—0 to 10 centimeters; very flaggy moderately decomposed plant material

A—10 to 18 centimeters; very flaggy fine sandy loam

Bw—18 to 40 centimeters; very flaggy fine sandy loam

2R—40 to 200 centimeters; bedrock

## Description of the Voyageurs Soil

### Setting

*Landform:* Flats on lake plains

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Slope range:* 0 to 5 percent

*Parent material:* Silty glaciolacustrine deposits over water-worked till over igneous rock

### Properties and Qualities

*Depth to restrictive feature:* 120 to 160 centimeters to lithic bedrock

*Shrink-swell potential:* High (about 6.5 LEP)

*Slowest capacity to transmit water ( $K_{sat}$ ):* Moderately high

*Natural drainage class:* Somewhat poorly drained

*Flooding frequency:* None

*Ponding frequency:* None

*Seasonal water table (depth, kind):* About 15 centimeters; perched (see table 21)

*Available water capacity (entire profile):* Moderate (about 17.3 centimeters)

### Interpretive Groups

*Land capability subclass (nonirrigated):* 2w

*Hydric soil status:* No

*Hydrologic soil group:* C/D

*Taxonomic classification:* Fine, smectitic, frigid Aquic Glossudalfs

### Typical Profile

A—0 to 7 centimeters; highly organic silt loam

E—7 to 17 centimeters; silt loam

E/B—17 to 30 centimeters; silt loam

Bt—30 to 70 centimeters; silty clay loam

2C—70 to 140 centimeters; very gravelly loamy sand

3R—140 to 200 centimeters; bedrock

### ***Description of the Wahlsten Soil***

#### **Setting**

*Landform:* Bedrock-controlled moraines

*Landform position (two-dimensional):* Summit and footslope

*Down-slope shape:* Linear

*Across-slope shape:* Linear

*Slope range:* 1 to 8 percent

*Parent material:* Coarse-loamy till over igneous rock

#### **Properties and Qualities**

*Depth to restrictive feature:* 51 to 102 centimeters to lithic bedrock

*Shrink-swell potential:* Low (about 0.6 LEP)

*Slowest capacity to transmit water ( $K_{sat}$ ):* Moderately high

*Natural drainage class:* Moderately well drained

*Flooding frequency:* None

*Ponding frequency:* None

*Seasonal water table (depth, kind):* About 61 centimeters; perched (see table 21)

*Available water capacity (entire profile):* Low (about 7.7 centimeters)

#### **Interpretive Groups**

*Land capability subclass (nonirrigated):* 6s

*Hydric soil status:* No

*Hydrologic soil group:* C

*Taxonomic classification:* Coarse-loamy, isotic, frigid Oxyaquic Dystrudepts

#### **Typical Profile**

A—0 to 9 centimeters; very cobbly highly organic loam

Bw1—9 to 22 centimeters; cobbly sandy loam

Bw2—22 to 78 centimeters; cobbly sandy loam

R—78 to 200 centimeters; bedrock

### ***Minor Components***

#### **Conic soils**

*Percent of map unit:* 10 percent

*Slope:* 2 to 12 percent

*Landform:* Bedrock-controlled moraines

*Depth to restrictive feature:* 51 to 102 centimeters to lithic bedrock

*Natural drainage class:* Well drained

*Hydric soil status:* No

#### **Spooner soils**

*Percent of map unit:* 8 percent

*Slope:* 0 to 3 percent

*Landform:* Flats and drainageways on lake plains

*Depth to restrictive feature:* 102 to 190 centimeters to lithic bedrock

*Natural drainage class:* Poorly drained

*Hydric soil status:* Yes

#### **Brickton soils**

*Percent of map unit:* 5 percent

*Slope:* 0 to 2 percent

*Landform:* Flats and drainageways on lake plains

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Natural drainage class:* Poorly drained

*Hydric soil status:* Yes

**Dishno soils**

*Percent of map unit:* 5 percent

*Slope:* 0 to 8 percent

*Landform:* Bedrock-controlled moraines

*Depth to restrictive feature:* 50 to 150 centimeters to lithic bedrock

*Natural drainage class:* Moderately well drained

*Hydric soil status:* No

**Aquepts, loamy-skeletal**

*Percent of map unit:* 3 percent

*Slope:* 0 to 2 percent

*Landform:* Drainageways on bedrock-controlled moraines

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Natural drainage class:* Very poorly drained

*Ponding frequency:* Frequent

*Hydric soil status:* Yes

**Aquepts, fine-loamy**

*Percent of map unit:* 2 percent

*Slope:* 0 to 2 percent

*Landform:* Depressions on lake plains

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Natural drainage class:* Very poorly drained

*Ponding frequency:* Frequent

*Hydric soil status:* Yes

**Rock outcrop**

*Percent of map unit:* 2 percent

*Slope:* 0 to 12 percent

*Landform:* Hillslopes

**2srrt—Bowstring and Fluvaquents soils, 0 to 2 percent slopes, frequently flooded**

***Map Unit Setting***

*Landscape:* Bedrock uplands

*Major land resource area:* 93—Superior Stony and Rocky Loamy Plains and Hills

*Elevation:* 337.0 to 429 meters

*Mean annual precipitation:* 660 to 960 millimeters

*Mean annual air temperature:* 2 to 5 degrees C

*Frost-free period:* 60 to 140 days

*Farmland classification for map unit:* Not prime farmland

***Map Unit Composition***

Bowstring and similar soils: 50 percent

Fluvaquents and similar soils: 40 percent

Dissimilar minor components: 10 percent

***Description of the Bowstring Soil***

**Setting**

*Landform:* Drainageways on lake plains

*Down-slope shape:* Linear

*Across-slope shape:* Concave



*Slope range:* 0 to 1 percent

*Parent material:* Herbaceous organic material over stratified loamy herbaceous organic material over loamy alluvium

#### **Properties and Qualities**

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Shrink-swell potential:* Low (about 0.2 LEP)

*Slowest capacity to transmit water ( $K_{sat}$ ):* Moderately high

*Natural drainage class:* Very poorly drained

*Flooding frequency:* Frequent (see table 21)

*Ponding frequency:* None

*Depth to seasonal water table:* At the soil surface (see table 21)

*Available water capacity (entire profile):* Very high (about 76.9 centimeters)

#### **Interpretive Groups**

*Land capability subclass (nonirrigated):* 8w

*Hydric soil status:* Yes

*Hydrologic soil group:* A/D

*Taxonomic classification:* Euic, frigid Fluvaquentic Haplosaprists

#### **Typical Profile**

Oa1—0 to 155 centimeters; muck

Cg1—155 to 156 centimeters; mucky silt loam

O'a2—156 to 185 centimeters; muck

C'g2—185 to 200 centimeters; silt loam

### **Description of Fluvaquents**

#### **Setting**

*Landform:* Drainageways on lake plains (fig. 30)

*Down-slope shape:* Linear

*Across-slope shape:* Concave

*Slope range:* 0 to 2 percent

*Parent material:* Loamy alluvium

#### **Properties and Qualities**

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Shrink-swell potential:* Low (about 1.4 LEP)

*Slowest capacity to transmit water ( $K_{sat}$ ):* Moderately high

*Natural drainage class:* Very poorly drained

*Flooding frequency:* Frequent (see table 21)

*Ponding frequency:* None

*Depth to seasonal water table:* At the soil surface (see table 21)

*Available water capacity (entire profile):* Very high (about 35.7 centimeters)

#### **Interpretive Groups**

*Land capability subclass (nonirrigated):* 5w

*Hydric soil status:* Yes

*Hydrologic soil group:* B/D

*Taxonomic classification:* Fluvaquents

#### **Typical Profile**

Oe—0 to 15 centimeters; mucky peat

A—15 to 25 centimeters; mucky loam

Cg1—25 to 40 centimeters; loam

Ab—40 to 64 centimeters; mucky loam

2Cg2—64 to 200 centimeters; stratified silt loam to cobbly loamy coarse sand



Figure 30.—An area of Fluvaquents with alder brush.

### ***Minor Components***

#### **Cathro soils**

*Percent of map unit:* 10 percent

*Slope:* 0 to 1 percent

*Landform:* Depressions and drainageways on lake plains

*Depth to restrictive feature:* None within a depth of 150 centimeters

*Natural drainage class:* Very poorly drained

*Flooding frequency:* Frequent

*Hydric soil status:* Yes

### **W—Water**

#### ***Map Unit Composition***

Water: 100 percent



# Use and Management of the Soils

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This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for rangeland and forestland and as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

## Interpretive Ratings

The interpretive tables in this survey rate the soils in the survey area for various uses. Many of the tables identify the limitations that affect specified uses and indicate the severity of those limitations. The ratings in these tables are both verbal and numerical.

## Rating Class Terms

Rating classes are expressed in the tables in terms that indicate the extent to which the soils are limited by all of the soil features that affect a specified use or in terms that indicate the suitability of the soils for the use. Thus, the tables may show limitation classes or suitability classes. Terms for the limitation classes are *not limited*, *somewhat limited*, and *very limited*. The suitability ratings are expressed as *well suited*, *moderately suited*, *poorly suited*, and *unsuited* or as *good*, *fair*, and *poor*.

## Numerical Ratings

Numerical ratings in the tables indicate the relative severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.00 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use and the point at which the soil feature is not a limitation. The limitations

appear in order from the most limiting to the least limiting. Thus, if more than one limitation is identified, the most severe limitation is listed first and the least severe one is listed last.

## Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for forestland, or for engineering purposes.

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit (USDA-SCS, 1961). Only class and subclass are used in this survey.

*Capability classes*, the broadest groups, are designated by the numbers 1 through 8. The numbers indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class 1 soils have slight limitations that restrict their use.

Class 2 soils have moderate limitations that restrict the choice of plants or that require moderate conservation practices.

Class 3 soils have severe limitations that restrict the choice of plants or that require special conservation practices, or both.

Class 4 soils have very severe limitations that restrict the choice of plants or that require very careful management, or both.

Class 5 soils are subject to little or no erosion but have other limitations, impractical to remove, that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.

Class 6 soils have severe limitations that make them generally unsuitable for cultivation and that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.

Class 7 soils have very severe limitations that make them unsuitable for cultivation and that restrict their use mainly to grazing, forestland, or wildlife habitat.

Class 8 soils and miscellaneous areas have limitations that preclude commercial plant production and that restrict their use to recreational purposes, wildlife habitat, watershed, or esthetic purposes.

*Capability subclasses* are soil groups within one class. They are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, 2*e*. The letter *e* shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class 1 there are no subclasses because the soils of this class have few limitations. Class 5 contains only the subclasses indicated by *w*, *s*, or *c* because the soils in class 5 are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, forestland, wildlife habitat, or recreation.

The capability classification of map units in this park is given in the section “Detailed Soil Map Units” and in table 7.



## Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation's short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pastureland, forestland, or other land, but it is not urban or built-up land or water areas. The soil qualities, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management, including water management, and acceptable farming methods are applied. In general, prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, an acceptable salt and sodium content, and few or no rocks. It is permeable to water and air. It is not excessively erodible or saturated with water for long periods, and it either is not frequently flooded during the growing season or is protected from flooding. Slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service.

There are no areas in Voyageurs National Park that meet the soil requirements for prime farmland.

## Hydric Soils

Table 8 lists the map units that are rated as hydric soils in the survey area. This list can help in planning land uses; however, onsite investigation is recommended to determine the hydric soils on a specific site (USDA-NRCS, 2012).

The three essential characteristics of wetlands are hydrophytic vegetation, hydric soils, and wetland hydrology (Cowardin et al., 1979; U.S. Army Corps of Engineers, 1987; National Research Council, 1995; Tiner, 1985). Criteria for all of the characteristics must be met for areas to be identified as wetlands. Undrained hydric soils that have natural vegetation should support a dominant population of ecological wetland plant species. Hydric soils that have been converted to other uses should be capable of being restored to wetlands. Onsite investigation is recommended to determine the hydric soils on a specific site (National Research Council, 1995; USDA-NRCS, 2010).

Hydric soils are defined by the National Technical Committee for Hydric Soils (NTCHS) as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (Federal Register, 1994). These soils, under natural conditions, are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation.

The NTCHS definition identifies general soil properties that are associated with wetness. In order to determine whether a specific soil is a hydric soil or nonhydric soil, however, more specific information, such as information about the depth and duration of the water table, is needed. Thus, criteria that identify those estimated soil properties unique to hydric soils have been established (Federal Register, 2002). These criteria are used to identify map unit components that normally are associated with wetlands. The criteria used are selected estimated soil properties that are described in "Soil

Taxonomy” (Soil Survey Staff, 1999) and “Keys to Soil Taxonomy” (Soil Survey Staff, 2014) and in the “Soil Survey Manual” (Soil Survey Division Staff, 2017).

If soils are wet enough for a long enough period of time to be considered hydric, they should exhibit certain properties that can be easily observed in the field. These visible properties are indicators of hydric soils. The indicators used to make onsite determinations of hydric soils are specified in “Field Indicators of Hydric Soils in the United States” (USDA-NRCS, 2010).

Hydric soils are identified by examining and describing the soil to a depth of about 20 inches. This depth may be greater if determination of an appropriate indicator so requires. It is always recommended that soils be excavated and described to the depth necessary for an understanding of the redoximorphic processes. Then, using the completed soil descriptions, soil scientists can compare the soil features required by each indicator and specify which indicators have been matched with the conditions observed in the soil. The soil can be identified as a hydric soil if at least one of the approved indicators is present.

Map units that are dominantly made up of hydric soils may have small areas, or inclusions, of nonhydric soils in the higher positions on the landform, and map units dominantly made up of nonhydric soils may have inclusions of hydric soils in the lower positions on the landform.

The criteria for hydric soils are represented by codes. Definitions for the codes are as follows:

1. All Histels except for Folistels and Histosols except for Folists.
2. Soils in Aquic suborders, great groups, or subgroups, Albolls suborder, Historthels great group, Histoturbels great group, Pachic subgroups, or Cumulic subgroups that:
  - A. are somewhat poorly drained and have a water table at the surface (0.0 feet) during the growing season, or
  - B. are poorly drained or very poorly drained and have either:
    - 1) a water table at the surface (0.0 feet) during the growing season if textures are coarse sand, sand, or fine sand in all layers within a depth of 20 inches, or
    - 2) a water table at a depth of 0.5 foot or less during the growing season if saturated hydraulic conductivity ( $K_{sat}$ ) is equal to or greater than 6.0 in/hr in all layers within a depth of 20 inches, or
    - 3) a water table at a depth of 1.0 foot or less during the growing season if saturated hydraulic conductivity ( $K_{sat}$ ) is less than 6.0 in/hr in any layer within a depth of 20 inches.
3. Soils that are frequently ponded for periods of long or very long duration during the growing season.
4. Soils that are frequently flooded for periods of long or very long duration during the growing season.

## Land Management

In table 9, parts I through IV, interpretive ratings are given for various aspects of land management. The ratings are both verbal and numerical.

Some rating class terms indicate the degree to which the soils are suited to a specified land management practice. *Well suited* indicates that the soil has features that are favorable for the specified practice and has no limitations. Good performance can be expected, and little or no maintenance is needed. *Moderately suited* indicates that the soil has features that are moderately favorable for the specified practice. One or more soil properties are less than desirable, and fair performance can be expected. Some maintenance is needed. *Poorly suited* indicates that the soil has one or more properties that are unfavorable for the specified practice. Overcoming the unfavorable properties requires special design, extra maintenance, and costly alteration. *Unsuited*

indicates that the expected performance of the soil is unacceptable for the specified practice or that extreme measures are needed to overcome the undesirable soil properties.

Numerical ratings in the table indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the specified land management practice (1.00) and the point at which the soil feature is not a limitation (0.00).

Rating class terms for *fire damage* and *seedling mortality* are expressed as low, moderate, and high. Where these terms are used, the numerical ratings indicate gradations between the point at which the potential for fire damage or seedling mortality is highest (1.00) and the point at which the potential is lowest (0.00).

Rating class terms for *hazard of erosion* are expressed as slight, moderate, severe, and very severe. Where these terms are used, the numerical ratings indicate gradations between the point at which the potential for erosion is highest (1.00) and the point at which the potential is lowest (0.00).

The paragraphs that follow indicate the soil properties considered in rating the soils for land management practices.

### **Planting**

Ratings in the columns *suitability for hand planting* and *suitability for mechanical planting* are based on slope, depth to a restrictive layer, content of sand, plasticity index, rock fragments on or below the surface, depth to a water table, and ponding. The soils are described as well suited, moderately suited, poorly suited, or unsuited to these methods of planting. It is assumed that necessary site preparation is completed before seedlings are planted.

Ratings in the column *soil rutting hazard* are based on depth to a water table, rock fragments on or below the surface, the Unified classification, depth to a restrictive layer, and slope. Ruts form as a result of the operation of planting equipment. The hazard is described as slight, moderate, or severe. A rating of *slight* indicates that the soil is subject to little or no rutting, *moderate* indicates that rutting is likely, and *severe* indicates that ruts form readily.

### **Hazard of Erosion and Suitability for Roads**

Ratings in the column *hazard of erosion* are based on slope and on soil erodibility factor K. The soil loss is caused by sheet or rill erosion in areas where 50 to 75 percent of the surface has been exposed by different kinds of disturbance. The hazard is described as slight, moderate, severe, or very severe. A rating of *slight* indicates that erosion is unlikely under ordinary climatic conditions; *moderate* indicates that some erosion is likely and that erosion-control measures may be needed; *severe* indicates that erosion is very likely and that erosion-control measures, including revegetation of bare areas, are advised; and *very severe* indicates that significant erosion is expected, loss of soil productivity and off-site damage are likely, and erosion-control measures are costly and generally impractical.

Ratings in the column *hazard of erosion on roads and trails* are based on the soil erodibility factor K, slope, and content of rock fragments. The ratings apply to unsurfaced roads and trails. The hazard is described as slight, moderate, or severe. A rating of *slight* indicates that little or no erosion is likely; *moderate* indicates that some erosion is likely, that the roads or trails may require occasional maintenance, and that simple erosion-control measures are needed; and *severe* indicates that significant erosion is expected, that the roads or trails require frequent maintenance, and that costly erosion-control measures are needed.

Ratings in the column *suitability for roads (natural surface)* are based on slope, rock fragments on the surface, plasticity index, content of sand, the Unified classification,

depth to a water table, ponding, flooding, and the hazard of soil slippage. The ratings indicate the suitability for using the natural surface of the soil for roads. The soils are described as well suited, moderately suited, or poorly suited to this use.

### Site Preparation

Ratings in the column *suitability for mechanical site preparation (deep)* are based on slope, depth to a restrictive layer, rock fragments on or below the surface, depth to a water table, and ponding. The soils are described as well suited, poorly suited, or unsuited to this management activity. The part of the soil from the surface to a depth of about 3 feet is considered in the ratings.

Ratings in the column *suitability for mechanical site preparation (surface)* are based on slope, depth to a restrictive layer, plasticity index, rock fragments on or below the surface, depth to a water table, and ponding. The soils are described as well suited, poorly suited, or unsuited to this management activity. The part of the soil from the surface to a depth of about 1 foot is considered in the ratings.

### Site Restoration

Ratings in the column *potential for damage to soil by fire* are based on texture of the surface layer, content of rock fragments and organic matter in the surface layer, thickness of the surface layer, and slope. The soils are described as having a low, moderate, or high potential for this kind of damage. The ratings indicate an evaluation of the potential impact of prescribed fires or wildfires that are intense enough to remove the duff layer and consume organic matter in the surface layer.

Ratings in the column *potential for seedling mortality* are based on flooding, ponding, depth to a water table, content of lime, reaction, salinity, available water capacity, soil moisture regime, soil temperature regime, aspect, and slope. The soils are described as having a low, moderate, or high potential for seedling mortality.

## Recreational Development

The soils of the park are rated in table 10, parts I and II, according to limitations that affect their suitability for recreation. The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect the recreational uses. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the table indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

The ratings in the table are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation also are important. Soils that are subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season

when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

The information in table 10 can be supplemented by other information in this survey, for example, interpretations for building site development, construction materials, and water management.

*Camp areas* require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The ratings are based on the soil properties that affect the ease of developing camp areas and the performance of the areas after development. Slope, stoniness, and depth to bedrock or a cemented pan are the main concerns affecting the development of camp areas. The soil properties that affect the performance of the areas after development are those that influence trafficability and promote the growth of vegetation, especially in heavily used areas. For good trafficability, the surface of camp areas should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry. The soil properties that influence trafficability are texture of the surface layer, depth to a water table, ponding, flooding, permeability, and large stones. The soil properties that affect the growth of plants are depth to bedrock or a cemented pan, permeability, and toxic substances in the soil.

*Picnic areas* are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The ratings are based on the soil properties that affect the ease of developing picnic areas and that influence trafficability and the growth of vegetation after development. Slope and stoniness are the main concerns affecting the development of picnic areas. For good trafficability, the surface of picnic areas should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry. The soil properties that influence trafficability are texture of the surface layer, depth to a water table, ponding, flooding, permeability, and large stones. The soil properties that affect the growth of plants are depth to bedrock or a cemented pan, permeability, and toxic substances in the soil.

*Foot traffic and equestrian trails* for hiking and horseback riding should require little or no slope modification through cutting and filling. The ratings are based on the soil properties that affect trafficability and erodibility. These properties are stoniness, depth to a water table, ponding, flooding, slope, and texture of the surface layer.

*Mountain bike and off-road vehicle trails* require little or no site preparation. They are not covered with surfacing material or vegetation. Considerable compaction of the soil material is likely. The ratings are based on the soil properties that influence erodibility, trafficability, dustiness, and the ease of revegetation. These properties are stoniness, depth to a water table, ponding, slope, flooding, and texture of the surface layer.

## Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for building site development, sanitary facilities, and construction materials. The ratings are based on observed performance of the soils and on the data in the tables described under the heading "Soil Properties."

*Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil between the surface and a depth of 5 to 7 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.*



*The information is not site-specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.*

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about particle-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 7 feet of the surface, soil wetness, depth to a water table, ponding, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

## **Dwellings and Small Commercial Buildings**

Soil properties influence the development of building sites, including the selection of the site, the design of the structure, construction, performance after construction, and maintenance. Table 11 shows the degree and kind of soil limitations that affect dwellings and small commercial buildings.

The ratings in the table are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect building site development. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the table indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

*Dwellings* are single-family houses of three stories or less. For dwellings without basements, the foundation is assumed to consist of spread footings of reinforced

concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper. For dwellings with basements, the foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of about 7 feet. The ratings for dwellings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (shrink-swell potential), and compressibility. Compressibility is inferred from the Unified classification. The properties that affect the ease and amount of excavation include depth to a water table, ponding, flooding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments.

*Small commercial buildings* are structures that are less than three stories high and do not have basements. The foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper. The ratings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (shrink-swell potential), and compressibility (which is inferred from the Unified classification). The properties that affect the ease and amount of excavation include flooding, depth to a water table, ponding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments.

## Roads and Streets, Shallow Excavations, and Landscaping

Soil properties influence the development of building sites, including the selection of the site, the design of the structure, construction, performance after construction, and maintenance. Table 12 shows the degree and kind of soil limitations that affect local roads and streets, shallow excavations, and landscaping.

The ratings in the table are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect building site development. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the table indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

*Local roads and streets* have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or soil material stabilized by lime or cement; and a surface of flexible material (asphalt), rigid material (concrete), or gravel with a binder. The ratings are based on the soil properties that affect the ease of excavation and grading and the traffic-supporting capacity. The properties that affect the ease of excavation and grading are depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, depth to a water table, ponding, flooding, the amount of large stones, and slope. The properties that affect the traffic-supporting capacity are soil strength (as inferred

from the AASHTO group index number), subsidence, linear extensibility (shrink-swell potential), the potential for frost action, depth to a water table, and ponding.

*Shallow excavations* are trenches or holes dug to a maximum depth of 5 or 6 feet for graves, utility lines, open ditches, or other purposes. The ratings are based on the soil properties that influence the ease of digging and the resistance to sloughing. Depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, the amount of large stones, and dense layers influence the ease of digging, filling, and compacting. Depth to the seasonal high water table, flooding, and ponding may restrict the period when excavations can be made. Slope influences the ease of using machinery. Soil texture, depth to the water table, and linear extensibility (shrink-swell potential) influence the resistance to sloughing.

*Landscaping* requires soils on which turf, trees, and shrubs can be established and maintained. Irrigation is not considered in the ratings. The ratings are based on the soil properties that affect plant growth and trafficability after vegetation is established. The properties that affect plant growth are reaction; depth to a water table; ponding; depth to bedrock or a cemented pan; the available water capacity in the upper 40 inches; the content of salts, sodium, or calcium carbonate; and sulfidic materials. The properties that affect trafficability are flooding, depth to a water table, ponding, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer.

## Sewage Disposal

Table 13 shows the degree and kind of soil limitations that affect septic tank absorption fields and sewage lagoons. The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect these uses. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the table indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

*Septic tank absorption fields* are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches or between a depth of 24 inches and a restrictive layer is evaluated. The ratings are based on the soil properties that affect absorption of the effluent, construction and maintenance of the system, and public health. Saturated hydraulic conductivity ( $K_{sat}$ ), depth to a water table, ponding, depth to bedrock or a cemented pan, and flooding affect absorption of the effluent. Stones and boulders, ice, and bedrock or a cemented pan interfere with installation. Subsidence interferes with installation and maintenance. Excessive slope may cause lateral seepage and surfacing of the effluent in downslope areas.

Some soils are underlain by loose sand and gravel or fractured bedrock at a depth of less than 4 feet below the distribution lines. In these soils the absorption field may not adequately filter the effluent, particularly when the system is new. As a result, the ground water may become contaminated.

*Sewage lagoons* are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Nearly

impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water. Considered in the ratings are slope, saturated hydraulic conductivity ( $K_{sat}$ ), depth to a water table, ponding, depth to bedrock or a cemented pan, flooding, large stones, and content of organic matter.

Saturated hydraulic conductivity ( $K_{sat}$ ) is a critical property affecting the suitability for sewage lagoons. Most porous soils eventually become sealed when they are used as sites for sewage lagoons. Until sealing occurs, however, the hazard of pollution is severe. Soils that have a  $K_{sat}$  rate of more than 14 micrometers per second are too porous for the proper functioning of sewage lagoons. In these soils, seepage of the effluent can result in contamination of the ground water. Ground-water contamination is also a hazard if fractured bedrock is within a depth of 40 inches, if the water table is high enough to raise the level of sewage in the lagoon, or if floodwater overtops the lagoon.

A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor. If the lagoon is to be uniformly deep throughout, the slope must be gentle enough and the soil material must be thick enough over bedrock or a cemented pan to make land smoothing practical.

### Source of Gravel and Sand

Table 14 gives information about the soils as potential sources of gravel and sand. Normal compaction, minor processing, and other standard construction practices are assumed.

*Gravel* and *sand* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. Only the likelihood of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material. The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the Unified classification of the soil), the thickness of suitable material, and the content of rock fragments. If the bottom layer of the soil contains sand or gravel, the soil is considered a likely source regardless of thickness. The assumption is that the sand or gravel layer below the depth of observation exceeds the minimum thickness. The ratings are for the whole soil, from the surface to a depth of about 6 feet.

The soils are rated *good*, *fair*, or *poor* as potential sources of sand and gravel. A rating of *good* or *fair* means that the source material is likely to be in or below the soil. The bottom layer and the thickest layer of the soils are assigned numerical ratings. These ratings indicate the likelihood that the layer is a source of sand or gravel. The number 0.00 indicates that the layer is a poor source. The number 1.00 indicates that the layer is a good source. A number between 0.00 and 1.00 indicates the degree to which the layer is a likely source.

### Source of Reclamation Material, Roadfill, and Topsoil

Table 15 gives information about the soils as potential sources of reclamation material, roadfill, and topsoil. Normal compaction, minor processing, and other standard construction practices are assumed.

The soils are rated *good*, *fair*, or *poor* as potential sources of reclamation material, roadfill, and topsoil. The features that limit the soils as sources of these materials are specified in the table. Numerical ratings between 0.00 and 0.99 are given after the specified features. These numbers indicate the degree to which the features limit the soils as sources of topsoil, reclamation material, or roadfill. The lower the number, the greater the limitation.

*Reclamation material* is used in areas that have been drastically disturbed by surface mining or similar activities. When these areas are reclaimed, layers of soil material or unconsolidated geological material, or both, are replaced in a vertical sequence. The reconstructed soil favors plant growth. The ratings in the table do not apply to quarries and other mined areas that require an offsite source of reconstruction material. The ratings are based on the soil properties that affect erosion and stability of the surface and the productive potential of the reconstructed soil. These properties include the content of sodium, salts, and calcium carbonate; reaction; available water capacity; erodibility; texture; content of rock fragments; and content of organic matter and other features that affect fertility.

*Roadfill* is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments. The ratings are for the whole soil, from the surface to a depth of about 5 feet. It is assumed that soil layers will be mixed when the soil material is excavated and spread.

The ratings are based on the amount of suitable material and on soil properties that affect the ease of excavation and the performance of the material after it is in place. The thickness of the suitable material is a major consideration. The ease of excavation is affected by large stones, depth to a water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the AASHTO classification of the soil) and linear extensibility (shrink-swell potential).

*Topsoil* is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area. The ratings are based on the soil properties that affect plant growth; the ease of excavating, loading, and spreading the material; and reclamation of the borrow area. Toxic substances, soil reaction, and the properties that are inferred from soil texture, such as available water capacity and fertility, affect plant growth. The ease of excavating, loading, and spreading is affected by rock fragments, slope, depth to a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, depth to a water table, rock fragments, depth to bedrock or a cemented pan, and toxic material.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.



# Soil Properties

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Data relating to soil properties are collected during the course of the soil survey. Soil properties are ascertained by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical pedons and tested in the laboratory to determine particle-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties are shown in tables. They include engineering index properties, physical and chemical properties, and pertinent soil and water features.

Appendix 3 gives information on pedons that were analyzed by the Charles E. Kellogg Soil Survey Laboratory, Lincoln, Nebraska. The table gives current soil name, pedon type, user site ID, user pedon ID, lab source, and lab pedon number.

## Engineering Properties

Table 16 gives the engineering classifications and the range of engineering properties for the layers of each soil in the park.

*Depth* to the upper and lower boundaries of each layer is indicated.

*Texture* is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is 15 percent or more, an appropriate modifier is added, for example, "gravelly."

*Classification* of the soils is determined according to the Unified soil classification system (ASTM, 2005) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 2013).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to particle-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of particle-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the

other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

*Rock fragments* larger than 250 millimeters in diameter and 70 to 250 millimeters in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

*Percentage (of soil particles) passing designated sieves* is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

*Liquid limit* and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

## Physical Soil Properties

Table 17 shows estimates of some physical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the park. The estimates are based on field observations and on test data for these and similar soils.

*Depth* to the upper and lower boundaries of each layer is indicated.

Particle size is the effective diameter of a soil particle as measured by sedimentation, sieving, or micrometric methods. Particle sizes are expressed as classes with specific effective diameter class limits. The broad classes are sand, silt, and clay, ranging from the larger to the smaller.

*Sand* as a soil separate consists of mineral soil particles that are 0.05 millimeter to 2 millimeters in diameter. In this table, the estimated sand content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

*Silt* as a soil separate consists of mineral soil particles that are 0.002 to 0.05 millimeter in diameter. In this table, the estimated silt content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

*Clay* as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of sand, silt, and clay affects the physical behavior of a soil. Particle size is important for engineering and agronomic interpretations, for determination of soil hydrologic qualities, and for soil classification.

The amount and kind of clay affect the fertility and physical condition of the soil and the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, saturated hydraulic conductivity ( $K_{sat}$ ), plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

*Moist bulk density* is the weight of soil (oven-dry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at  $1/3$ - or  $1/10$ -bar (33kPa or 10kPa) moisture tension. Weight is determined after the soil is dried at 105 degrees C. In the table, the estimated moist bulk density of each soil

horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute linear extensibility, shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. Depending on soil texture, a bulk density of more than 1.4 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

*Permeability* ( $K_{sat}$ ) refers to the ability of a soil to transmit water or air. The term "permeability," as used in soil surveys, indicates saturated hydraulic conductivity ( $K_{sat}$ ). The estimates in the table indicate the rate of water movement, in inches per hour, when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

*Available water capacity* refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each soil layer. The capacity varies, depending on soil properties that affect retention of water. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

*Shrink-swell potential* is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on the basis of measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; *high*, 6 to 9 percent; and *very high*, greater than 9 percent.

*Organic matter* is the plant and animal residue in the soil at various stages of decomposition. In this table, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained by returning crop residue to the soil. Organic matter has a positive effect on available water capacity, water infiltration, soil organism activity, and tilth. It is a source of nitrogen and other nutrients for crops and soil organisms.

## Erosion Properties

Table 18 shows estimates of some erosion factors that affect a soil's potential for different uses. These estimates are given for each layer of every soil for K factors and are given as one rating for the entire soil for the T factor, the wind erodibility group, and the wind erodibility index. Values are reported for each soil in the park. Estimates are based on field observations and on test data for these and similar soils.

Erosion factors are shown in the table as the K factor ( $K_w$  and  $K_f$ ) and the T factor. Soil erosion factors ( $K_w$ ) and ( $K_f$ ) quantify soil detachment by runoff and raindrop impact. These erosion factors are indexes used to predict the long-term average soil loss from sheet and rill erosion under crop systems and conservation techniques.

Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and  $K_{sat}$ . Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

The procedure for determining the Kf factor is outlined in Agriculture Handbook 703, "Predicting Soil Erosion by Water: A Guide to Conservation Planning With the Revised Universal Soil Loss Equation (RUSLE)," USDA, Agricultural Research Service, 1997.

*Erosion factor Kw* indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments. In horizons where total rock fragments are 15 percent or more, by volume, the Kw factor is always less than the Kf factor.

*Erosion factor Kf* indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size. Soil horizons that do not have rock fragments are assigned equal Kw and Kf factors.

*Erosion factor T* is an estimate of the maximum average annual rate of soil erosion by wind and/or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

*Wind erodibility groups* are made up of soils that have similar properties affecting their susceptibility to wind erosion in cultivated areas. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. The groups are described in the "National Soil Survey Handbook."

*Wind erodibility index* is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion. There is a close correlation between wind erosion and the texture of the surface layer, the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence wind erosion.

## Total Soil Carbon

Table 19 gives estimates of total soil carbon. Soil carbon occurs as organic and inorganic carbon.

Soil organic carbon (SOC) is carbon (C) in soil that originated from a biological source, such as plants, animals, or micro-organisms. SOC is found in both organic and mineral soil layers. The term "soil organic carbon" refers only to the carbon occurring in soil organic matter (SOM). Soil organic carbon makes up about one-half the weight of soil organic matter. The rest of SOM is mostly oxygen, nitrogen, and hydrogen.

Soil inorganic carbon (SIC) is carbon found in soil carbonates, typically as calcium carbonate layers in the soil or as clay-sized fractions throughout the soil. Carbonates in soils are most common in areas where evaporation rates exceed precipitation, as is the case in most desert environments. Typically, the carbonates accumulated from carbonatic dust or from solution during periods of wetter climates. Soil inorganic carbon also occurs in soils that formed in marl in all regions of the country.

The SOC and SIC contents are reported in kilograms per square meter to a depth of 2 meters or to a representative depth of either hard bedrock or a cemented horizon. The SOC and SIC values are on a whole soil basis, corrected for rock fragments.

SOC can be an indicator of overall soil fertility and soil quality that affects ecosystem function. SOM is the main reservoir for most plant nutrients, such as phosphorus and nitrogen. Managing for SOC by managing for SOM increases the content of these elements and improves soil resiliency.

Soil organic matter binds soil particles together and thus increases soil porosity and water infiltration and allows better root penetration and waterflow into the soil. Greater inflow of water reduces the hazard of erosion and the rate of surface water runoff.

Greater SOC levels improve not only soil quality but also the quality of air and water. Soil acts as a filter and improves water quality. Fertile soils that support plant life

remove CO<sub>2</sub> from the atmosphere and increase oxygen levels through photosynthesis. Maintaining the level of soil organic carbon reduces C release into the atmosphere and thus can lessen the effects of global warming.

SIC influences the types of plants that will grow. High SIC levels are commonly associated with a higher soil pH, which limits the types of plants that will thrive.

Like SOM, soil carbonates, the source of SIC, also bind soil particles together. They fill voids in the soil and thus can reduce soil porosity. Compacted soil carbonates may restrict root penetration and waterflow into the soil.

## Soil Features

Table 20 gives estimates of various soil features. The estimates are used in land use planning that involves engineering considerations.

A *restrictive layer* is a nearly continuous layer that has one or more physical, chemical, or thermal properties that significantly impede the movement of water and air through the soil or that restrict roots or otherwise provide an unfavorable root environment. Examples are bedrock, cemented layers, dense layers, and frozen layers. The table indicates the hardness and thickness of the restrictive layer, both of which significantly affect the ease of excavation. *Depth to top* is the vertical distance from the soil surface to the upper boundary of the restrictive layer.

*Potential for frost action* is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, saturated hydraulic conductivity ( $K_{sat}$ ), content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage to pavements and other rigid structures.

*Risk of corrosion* pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel or concrete in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the steel or concrete in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion also is expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

## Water Features

Table 21 gives estimates of various soil water features. The estimates are used in land use planning that involves engineering considerations.

*Hydrologic soil groups* are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.



The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas.

The *months* in the table indicate the portion of the year in which a water table, ponding, and/or flooding is most likely to be a concern.

*Water table* refers to a saturated zone in the soil. Table 21 indicates, by month, depth to the top (*upper limit*) and base (*lower limit*) of the saturated zone in most years. Estimates of the upper and lower limits are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors or mottles (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

*Ponding* is standing water in a closed depression. Unless a drainage system is installed, the water is removed only by percolation, transpiration, or evaporation. The table indicates *surface water depth* and the *duration* and *frequency* of ponding. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, rare, occasional, and frequent. *None* means that ponding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of ponding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs, on the average, once or less in 2 years (the chance of ponding is 5 to 50 percent in any year); and *frequent* that it occurs, on the average, more than once in 2 years (the chance of ponding is more than 50 percent in any year).

*Flooding* is the temporary inundation of an area caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

*Duration* and *frequency* are estimated. Duration is expressed as *extremely brief* if 0.1 hour to 4 hours, *very brief* if 4 hours to 2 days, *brief* if 2 to 7 days, *long* if 7 to 30 days, and *very long* if more than 30 days. Frequency is expressed as none, very rare, rare, occasional, frequent, and very frequent. *None* means that flooding is not probable; *very rare* that it is very unlikely but possible under extremely unusual weather conditions (the chance of flooding is less than 1 percent in any year); *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is 1 to 5 percent in any year); *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); *frequent* that it is likely to occur often under normal weather conditions (the chance of flooding is more than 50 percent in any year but is less than 50 percent in all months in any year); and

*very frequent* that it is likely to occur very often under normal weather conditions (the chance of flooding is more than 50 percent in all months of any year).

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

## Chemical Soil Properties

Table 22 shows estimates of some chemical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the park. The estimates are based on field observations and on test data for these and similar soils.

*Depth* to the upper and lower boundaries of each layer is indicated.

*Cation-exchange capacity* is the total amount of extractable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. Soils having a low cation-exchange capacity hold fewer cations and may require more frequent applications of fertilizer than soils having a high cation-exchange capacity. The ability to retain cations reduces the hazard of ground-water pollution.

*Effective cation-exchange capacity* refers to the sum of exchangeable cations plus aluminum expressed in terms of milliequivalents per 100 grams of soil. It is determined for soils that have pH of less than 5.5.

*Soil reaction* is a measure of acidity or alkalinity. The pH of each soil horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

*Calcium carbonate* equivalent is the percent of carbonates, by weight, in the fraction of the soil less than 2 millimeters in size. The availability of plant nutrients is influenced by the amount of carbonates in the soil. Incorporating nitrogen fertilizer into calcareous soils helps to prevent nitrite accumulation and ammonium-N volatilization.

*Gypsum* is expressed as a percent, by weight, of hydrated calcium sulfates in the fraction of the soil less than 20 millimeters in size. Gypsum is partially soluble in water. Soils that have a high content of gypsum may collapse if the gypsum is removed by percolating water.

*Salinity* is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

*Sodium adsorption ratio* (SAR) is a measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration. Soils that have SAR values of 13 or more may be characterized by an increased dispersion of organic matter and clay particles, reduced saturated hydraulic conductivity ( $K_{sat}$ ) and aeration, and a general degradation of soil structure.



# Classification of the Soils

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The system of soil classification used by the National Cooperative Soil Survey has six categories (Soil Survey Staff, 1999 and 2014). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 23 shows the classification of the soils in the survey area. The extent of the soils is shown in table 5. The categories of soil classification are defined in the following paragraphs.

**ORDER.** Soil taxonomy at the highest hierarchical level identifies 12 soil orders. The names for the orders and taxonomic soil properties relate to Greek, Latin, or other root words that reveal something about the soil. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Alfisol.

**SUBORDER.** Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. Sixty-four suborders are recognized at the next level of classification. The last syllable in the name of a suborder indicates the order. An example is Udalf (*Ud*, meaning humid, plus *alf*, from Alfisol).

**GREAT GROUP.** Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; type of saturation; and base status. There are about 300 great groups. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Glossudalfs (*Gloss*, indicating a glossic horizon, plus *udalf*, the suborder of the Alfisols that has a udic moisture regime).

**SUBGROUP.** There are more than 2,400 subgroups. Each great group has a typical subgroup. The typical subgroup is the central concept of the great group; it is not necessarily the most extensive. Other subgroups are intergrades or extragrades. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other taxonomic class. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Aquic* identifies the subgroup that is wetter than typical for the great group. An example is Aquic Glossudalfs.

**FAMILY.** Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties for family placement are those of horizons below a traditional agronomic plow depth. Among the properties and characteristics considered are particle-size class, mineralogy class, cation-exchange activity class, soil temperature regime, soil depth, and reaction class. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine, mixed, active, frigid Aquic Glossudalfs.

**SERIES.** The soil series is the lowest category in the soil classification system. The series consists of soils within a family that have horizons similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series. A soil series taxadjunct is recognized where a soil cannot be classified within a soil series range of characteristics. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to significantly affect interpretations. A soil series is commonly named for a location where it was first classified. For example, the Voyageurs series was established in Voyageurs National Park.

Twenty-eight soil series are recognized as soil components in the detailed soil map units of Voyageurs National Park. In addition, some taxadjuncts and taxon above family classification are recognized.

## Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. Characteristics of the soil and the material in which it formed are identified for each series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the “Field Book for Describing and Sampling Soils” (Schoeneberger et al., 2002) and the “Soil Survey Manual” (Soil Survey Division Staff, 2017). Many of the technical terms used in the descriptions are defined in “Soil Taxonomy” (Soil Survey Staff, 1999) and in “Keys to Soil Taxonomy” (Soil Survey Staff, 2014). Unless otherwise stated, colors in the descriptions are for moist soil.

## Aquents

Aquents consist of very deep, very poorly drained soils on ponds on drainageways on lake plains. Permeability is moderate. Slopes are 0 to 1 percent.

### Taxonomic Classification

Aquents

#### Typical Pedon

Aquents mucky peat; latitude 48.5260778, longitude -92.8431889, datum WGS84; UTM Zone 15, UTM Easting 511578 meters, UTM Northing 5374786 meters.

Oe—0 to 2 centimeters; very dark brown (10YR 2/2) mucky peat; massive; 2 percent gravel; very strongly acid.

A—2 to 6 centimeters; black (10YR 2/1) loam; massive; 2 percent gravel; slightly acid.

AC—6 to 25 centimeters; very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) loam; massive; 10 percent yellowish brown (10YR 5/6) masses of oxidized iron; 2 percent gravel; slightly acid.

2C—25 to 70 centimeters; gray (5Y 5/1) silt loam; massive; 20 percent strong brown (7.5YR 5/6) masses of oxidized iron; neutral.

3C—70 to 120 centimeters; variegated strong brown (7.5YR 4/6) and brown (7.5YR 5/2) stratified very fine sand to silt loam; massive; neutral.

4C—120 to 200 centimeters; dark gray (2.5Y 4/1) silt loam; massive; neutral.



## Aquepts, Fine-Loamy

Aquepts, fine-loamy, consist of very deep, very poorly drained soils on depressions on lake plains. Permeability is moderately slow. Slopes range from 0 to 2 percent. This soil is identified in the tables as “Aquepts, stony, moderately slow Ksat.”

### Taxonomic Classification

Fine-loamy, nonacid, frigid Typic Endoaquepts

#### Typical Pedon (fig. 31)

Aquepts mucky loam; latitude 48 degrees 28 minutes 55.01 seconds N. and longitude 92 degrees 48 minutes 25.51 seconds W., datum WGS84; UTM Zone 15, UTM Easting 514256 meters, UTM Northing 5369887 meters.

A—0 to 18 centimeters; black (2.5Y 2/1), broken face, mucky loam; moderate medium granular structure; very strongly acid.

AB—18 to 38 centimeters; brown (10YR 4/3) fine sandy loam; weak medium subangular blocky structure; 2 percent yellowish brown (10YR 5/6) masses of oxidized iron and 2 percent grayish brown (10YR 5/2) iron depletions; 4 percent cobbles and 10 percent gravel; strongly acid.

2Bg1—38 to 50 centimeters; light gray (10YR 6/1) loam; moderate medium subangular blocky structure; 25 percent yellowish brown (10YR 5/6) masses of oxidized iron; 5 percent gravel; neutral.

2Bg2—50 to 98 centimeters; gray (N 6/0) silty clay loam; moderate medium subangular blocky structure; 25 percent yellowish brown (10YR 5/6) masses of oxidized iron; 1 percent gravel; neutral.

2C—98 to 200 centimeters; dark yellowish brown (10YR 4/4) gravelly loam; massive; 5 percent cobbles and 20 percent gravel; neutral.

## Aquepts, Loamy-Skeletal

Aquepts, loamy-skeletal consist of very deep, very poorly drained soils on depressions on lake plains (fig. 31). Permeability is moderately slow. Slopes range from 0 to 2 percent. This soil is identified in the tables as “Aquepts, very rubbly.”

### Taxonomic Classification

Loamy-skeletal, nonacid, frigid Typic Endoaquepts

#### Typical Pedon

Aquepts mucky extremely stony loam; latitude 48.5024778, longitude -92.8013250, datum WGS84; UTM Zone 15, UTM Easting 514676 meters, UTM Northing 5372170 meters.

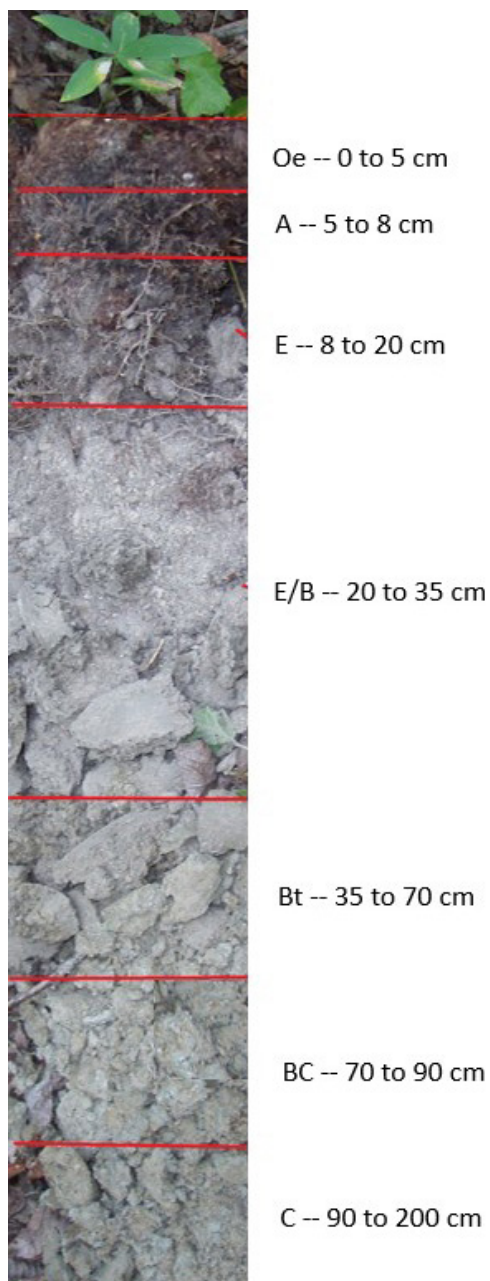
A—0 to 10 centimeters; very dark brown (10YR 2/2) mucky extremely stony loam; weak medium granular structure; 35 percent stones, 25 percent cobbles, and 2 percent gravel; strongly acid.

Bg1—10 to 28 centimeters; greenish gray (10Y 5/1) very stony loam; weak medium subangular blocky structure; 10 percent dark yellowish brown (10YR 4/6) iron-manganese masses; 15 percent stones, 15 percent cobbles, and 10 percent gravel; strongly acid.

Bg2—28 to 102 centimeters; grayish brown (2.5Y 5/2) cobbly fine sandy loam; weak medium subangular blocky structure; 20 percent dark yellowish brown (10YR 4/6) iron-manganese masses and 20 percent dark gray (5Y 4/1) iron depletions; 10 percent cobbles and 10 percent gravel; strongly acid.



**Figure 31.—Sample auger tailings of Aquepts, located in an area of map unit 2srrk—Insula-Conic-Wahlsten complex, 0 to 25 percent slopes, very stony, very rocky. Scale is in centimeters.**



**Figure 32.—Profile of a Baudette soil.**

C—102 to 200 centimeters; brown (10YR 4/3) very gravelly sandy loam; massive; 20 percent strong brown (7.5YR 4/6) iron-manganese masses; 5 percent cobbles and 40 percent gravel; moderately acid.

## Arcadian Series

The Arcadian series consists of shallow, well drained soils on bedrock-controlled moraines. Permeability is moderately rapid. Slopes range from 3 to 35 percent.

### Taxonomic Classification

Loamy-skeletal, mixed, active, frigid Lithic Haplorthods

### Typical Pedon

Arcadian very cobbly highly organic sandy loam; latitude 48.1948817, longitude -92.2354964, datum WGS84; UTM Zone 15, UTM Easting 556813 meters, UTM Northing 5338243 meters.

Oi—0 to 6 centimeters; dark brown (10YR 3/3) slightly decomposed plant material.

A—6 to 7 centimeters; very dark gray (10YR 3/1) very cobbly highly organic silt loam; moderate fine granular structure; 15 percent gravel and 25 percent cobbles; very strongly acid.

E—7 to 14 centimeters; dark grayish brown (10YR 4/2) very cobbly fine sandy loam, brown (10YR 5/3) dry; weak medium subangular blocky structure; 15 percent gravel and 25 percent cobbles; very strongly acid.

Bhs—14 to 21 centimeters; dark brown (10YR 3/3) very cobbly very fine sandy loam, dark yellowish brown (10YR 3/4) dry; weak medium subangular blocky structure; 15 percent gravel and 25 percent cobbles; very strongly acid.

Bs—21 to 41 centimeters; dark yellowish brown (10YR 3/4) very cobbly very fine sandy loam, dark brown (10YR 3/3) dry; weak medium subangular blocky structure; 15 percent gravel and 25 percent cobbles; strongly acid.

2R—41 to 200 centimeters; bedrock.

## Baudette Series

The Baudette series consists of very deep, moderately well drained soils on flats and slight rises on lake plains. Permeability is moderately slow. Slopes range from 0 to 8 percent.

### Taxonomic Classification

Fine-silty, mixed, superactive, frigid Oxyaquic Hapludalfs

### Typical Pedon (fig. 32)

Baudette highly organic silt loam; latitude 48.4793889, longitude -92.8020306, datum WGS84; UTM Zone 15, UTM Easting 514630 meters, UTM Northing 5369603 meters.

Oe—0 to 5 centimeters; very dark brown (7.5YR 2.5/3) moderately decomposed plant material.

A—5 to 8 centimeters; black (10YR 2/1) highly organic silt loam; moderate medium granular structure; very strongly acid.

E—8 to 20 centimeters; light gray (10YR 7/1) silt loam; weak fine granular structure; strongly acid.

E/B—20 to 35 centimeters; gray (10YR 6/1) silt loam and silty clay loam; moderate medium subangular blocky structure; strongly acid.

Bt—35 to 70 centimeters; dark grayish brown (2.5Y 4/2) silty clay loam; strong medium angular blocky structure; neutral.

BC—70 to 90 centimeters; light yellowish brown (2.5Y 6/3) silt loam; weak fine subangular blocky structure; slightly effervescent; slightly alkaline.

C—90 to 200 centimeters; light olive brown (2.5Y 5/3) silt loam; massive; strongly effervescent; slightly alkaline.

## Bootleg Series

The Bootleg series consists of very deep, poorly drained soils on flats and drainageways on lake plains. Permeability is slow. Slopes range from 0 to 2 percent.

### Taxonomic Classification

Fine-loamy, mixed, superactive, frigid Typic Albaqualfs

### Typical Pedon

Bootleg mucky peat; latitude 48.5438056, longitude -92.8970861, datum WGS84; UTM Zone 15, UTM Easting 507596 meters, UTM Northing 5376750 meters.

Oe—0 to 9 centimeters; black (7.5YR 2.5/1) mucky peat.

A1—9 to 15 centimeters; black (10YR 2/1) mucky silt loam; moderate medium granular structure; very strongly acid.

A2—15 to 27 centimeters; very dark gray (10YR 3/1) loamy sand; weak medium subangular blocky structure; strongly acid.

Bg—27 to 57 centimeters; dark grayish brown (10YR 4/2) loamy sand; weak medium subangular blocky structure; 20 percent strong brown (7.5YR 4/6) iron-manganese masses; strongly acid.

2Btg—57 to 137 centimeters; grayish brown (2.5Y 5/2) silty clay; moderate medium subangular blocky structure; 20 percent strong brown (7.5YR 4/6) iron-manganese masses; neutral.

2Cg—137 to 200 centimeters; light brownish gray (2.5Y 6/2) silty clay loam; massive; 20 percent strong brown (7.5YR 4/6) iron-manganese masses; strongly effervescent; slightly alkaline.

## Bowstring Series

The Bowstring series consists of very deep, very poorly drained soils on drainageways on lake plains. Permeability is moderately rapid. Slopes are 0 to 1 percent.

### Taxonomic Classification

Euic, frigid Fluvaquentic Haplosaprists

### Typical Pedon

Bowstring muck; latitude 48.5257694, longitude -92.8431639, datum WGS84; UTM Zone 15, UTM Easting 511580 meters, UTM Northing 5374752 meters.

Oa—0 to 155 centimeters; very dark brown (10YR 2/2) muck; massive; moderately acid.

Oa and C—155 to 185 centimeters; 85 percent gray (5Y 5/1) and 15 percent very dark brown (10YR 2/2) stratified silt loam to muck; massive; moderately acid.

Cg—185 to 200 centimeters; greenish gray (5GY 5/1) silt loam; massive; slightly acid.



## Brickton Series

The Brickton series consists of very deep, poorly drained soils on flats and drainageways on lake plains. Permeability is slow. Slopes range from 0 to 2 percent.

### Taxonomic Classification

Fine, smectitic, frigid Chromic Vertic Albaqualfs

### Typical Pedon

Brickton mucky peat; latitude 48.5863667, longitude -93.1350361, datum WGS84; UTM Zone 15, UTM Easting 490042 meters, UTM Northing 5381484 meters.

Oe—0 to 15 centimeters; very dark gray (10YR 3/1) mucky peat.

A1—15 to 24 centimeters; black (2.5Y 2.5/1) mucky silt loam; moderate medium subangular blocky structure; very strongly acid.

A2—24 to 32 centimeters; black (2.5Y 2.5/1) silt loam; weak medium subangular blocky structure; strongly acid.

Btg—32 to 120 centimeters; gray (2.5Y 5/1) silty clay; moderate medium subangular blocky structure; 5 percent faint yellowish brown (10YR 5/6) iron-manganese masses and 5 percent faint dark greenish gray (10GY 4/1) iron depletions; neutral.

Bkg—120 to 139 centimeters; reddish brown (5YR 4/3) clay; moderate fine angular blocky structure; dark greenish gray (5GY 4/1) iron depletions; 25 percent carbonate masses; strongly effervescent; slightly alkaline.

3Cg—139 to 200 centimeters; dark greenish gray (10Y 4/1) clay; massive; slightly effervescent; slightly alkaline.

## Canthook Series

The Canthook series consists of very deep, somewhat poorly drained soils on flats on lake plains. Permeability is slow. Slopes range from 0 to 6 percent.

### Taxonomic Classification

Fine-loamy, mixed, superactive, frigid Aeric Albaqualfs

### Typical Pedon (fig. 33)

Canthook sandy loam; latitude 48.3664333, longitude -925041778, datum WGS84; UTM Zone 15, UTM Easting 536723 meters, UTM Northing 5357148 meters.

Oa—0 to 2 centimeters; black (10YR 2/1) highly decomposed plant material; abrupt wavy boundary.

A—2 to 12 centimeters; very dark brown (10YR 2/2) sandy loam; moderate medium subangular blocky structure; very strongly acid.

E—12 to 29 centimeters; brown (10YR 4/3) loamy sand; weak coarse subangular blocky structure; strongly acid.

2B/E—29 to 43 centimeters; olive brown (2.5Y 4/3) sandy loam and clay loam; strong coarse subangular blocky structure; 5 percent grayish brown (2.5Y 5/2) iron depletions and 10 percent yellowish brown (10YR 5/6) masses of oxidized iron; neutral.

2Btg—43 to 91 centimeters; dark grayish brown (2.5Y 4/2) clay loam; moderate coarse subangular blocky structure; 5 percent grayish brown (2.5Y 5/2) iron depletions and 10 percent yellowish brown (10YR 5/6) masses of oxidized iron; neutral.

2Cg—91 to 200 centimeters; 70 percent dark grayish brown (2.5Y 4/2) and 30 percent olive brown (2.5Y 4/3) stratified fine sandy loam to clay loam to silty clay loam;





Figure 33.—Auger tailings of Canthook soil. Scale is in centimeters.

massive; 5 percent grayish brown (2.5Y 5/2) iron depletions and 20 percent yellowish brown (10YR 5/6) masses of oxidized iron; strongly effervescent; slightly alkaline.

## Cathro Series

The Cathro series consists of very deep, very poorly drained soils on depressions and drainageways on lake plains. Permeability is moderately slow. Slopes are 0 to 1 percent.

### Taxonomic Classification

Loamy, mixed, euic, frigid Terric Haplosaprists

### Typical Pedon

Cathro mucky peat; latitude 48.4544778, longitude -92.8190833, datum WGS84; UTM Zone 15, UTM Easting 513377 meters, UTM Northing 5366831 meters.

Oe—0 to 14 centimeters; very dark brown (7.5YR 2.5/2) mucky peat; massive; very strongly acid.

Oa—14 to 42 centimeters; black (10YR 2/1) muck; massive; very strongly acid.

A1—42 to 48 centimeters; black (10YR 2/1) mucky silt loam; massive; moderately acid.

A2—48 to 62 centimeters; black (10YR 2/1) clay loam; massive; 5 percent gravel; slightly acid.

Cg—62 to 200 centimeters; dark gray (2.5Y 4/1) clay loam; massive; 5 percent gravel; neutral.

## Conic Series

The Conic series consists of moderately deep, well drained soils on bedrock-controlled moraines. Permeability is moderately rapid. Slopes range from 2 to 25 percent. The Conic soils in Voyageurs National Park are considered taxadjuncts because they have more rock fragments than is specified in the range of characteristics for the series.

### Taxonomic Classification

Loamy-skeletal, isotic, frigid Typic Dystrudepts

### Typical Pedon (fig. 34)

Conic highly organic very cobbly fine sandy loam; latitude 48.4771368, longitude -92.8505515, datum WGS84; UTM Zone 15, UTM Easting 511045 meters, UTM Northing 5369345 meters.

A—0 to 7 centimeters; black (10YR 2/1) highly organic very cobbly fine sandy loam; moderate medium granular structure; very strongly acid.

Bw1—7 to 14 centimeters; dark yellowish brown (10YR 4/4) very cobbly fine sandy loam; weak medium subangular blocky structure; very strongly acid.

Bw2—14 to 26 centimeters; dark yellowish brown (10YR 4/6) very cobbly fine sandy loam; weak medium subangular blocky structure; strongly acid.

Bw3—26 to 62 centimeters; yellowish brown (10YR 5/4) very cobbly fine sandy loam; weak coarse platy structure; strongly acid.

2R—62 to 200 centimeters; bedrock.

## Dalbo Series

The Dalbo series consists of very deep, somewhat poorly drained soils on flats on lake plains. Permeability is slow. Slopes range from 0 to 3 percent.

### Taxonomic Classification

Fine, smectitic, frigid Oxyaquic Vertic Hapludalfs

### Typical Pedon

Dalbo silt loam; latitude 48.5280472, longitude -92.8432222, datum WGS84; UTM Zone 15, UTM Easting 511575 meters, UTM Northing 5375005 meters.

A—0 to 18 centimeters; black (10YR 2/1) silt loam; moderate medium granular structure; very strongly acid.

E—18 to 38 centimeters; dark grayish brown (2.5Y 4/2) silt loam; moderate coarse platy structure; strongly acid.

Bt1—38 to 69 centimeters; olive brown (2.5Y 4/3) silty clay; moderate medium angular blocky structure; 5 percent olive brown (2.5Y 4/4) clay films; strongly acid.

Bt2—69 to 85 centimeters; olive brown (2.5Y 4/3) silty clay; moderate medium angular blocky structure; 1 percent light olive brown (2.5Y 5/6) masses of oxidized iron and 5 percent grayish brown (2.5Y 5/2) iron depletions; neutral.



Figure 34.—Profile of a Conic soil. Bedrock is at a depth of 75 centimeters. Scale is in centimeters.

- Bk—85 to 118 centimeters; light olive brown (2.5Y 5/3) silty clay loam; moderate medium angular blocky structure; 1 percent light olive brown (2.5Y 5/6) masses of oxidized iron and 25 percent gray (2.5Y 5/1) and grayish brown (2.5Y 5/2) iron depletions; 2 percent carbonate concretions; slightly effervescent; slightly alkaline.
- 2C—118 to 200 centimeters; reddish brown (2.5YR 4/4) silty clay; massive; 1 percent gray (2.5Y 5/1) iron depletions; 10 percent carbonate concretions; strongly effervescent; slightly alkaline.

## Dishno Series

The Dishno series consists of deep, moderately well drained soils on bedrock-controlled moraines. Permeability is moderately rapid. Slopes range from 0 to 8 percent. The Dishno soils in Voyageurs National Park are considered taxadjuncts because they have more rock fragments than is specified in the range of characteristics for the series.

### Taxonomic Classification

Coarse-loamy over sandy or sandy-skeletal, isotic, frigid Oxyaquic Haplorthods



### Typical Pedon

Dishno highly organic very cobbly sandy loam; latitude 48.5152101, longitude -93.0752068, datum WGS84; UTM Zone 15, UTM Easting 494446 meters, UTM Northing 5373569 meters.

- A—0 to 9 centimeters; black (10YR 2/1) highly organic very cobbly sandy loam; moderate medium granular structure; 17 percent cobbles and 23 percent gravel; very strongly acid; abrupt smooth boundary.
- E—9 to 18 centimeters; brown (7.5YR 4/2) very cobbly sandy loam; weak medium subangular blocky structure; 17 percent cobbles and 23 percent gravel; very strongly acid; clear smooth boundary.
- Bhs—18 to 37 centimeters; very dark brown (7.5YR 2.5/3) very cobbly sandy loam; weak medium subangular blocky structure; 17 percent cobbles and 23 percent gravel; very strongly acid; clear smooth boundary.
- Bs—37 to 53 centimeters; dark brown (7.5YR 3/4) gravelly sandy loam; weak medium subangular blocky structure; 20 percent gravel; strongly acid; clear smooth boundary.
- BC—53 to 114 centimeters; yellowish brown (10YR 5/4) gravelly sandy loam; weak medium subangular blocky structure; light brownish gray (10YR 6/2) iron depletions and strong brown (7.5YR 5/6) masses of oxidized iron; 20 percent gravel; strongly acid; clear wavy boundary.
- C—114 to 125 centimeters; light olive brown (2.5Y 5/3) gravelly loamy sand; massive; gray (10YR 6/1) iron depletions and yellowish brown (10YR 5/6) masses of oxidized iron; 20 percent gravel; strongly acid; abrupt smooth boundary.
- 2R—125 to 200 centimeters; bedrock.

## Durkeelake Series

The Durkeelake series consists of very deep, moderately well drained soils on slight rises on lake plains. Permeability is moderately slow. Slopes range from 0 to 12 percent. The Durkeelake soils in Voyageurs National Park are considered taxadjuncts because they predominantly lack a glossic horizon.

### Taxonomic Classification

Loamy, mixed, active, frigid Oxyaquic Hapludalfs

### Typical Pedon (fig. 35)

Durkeelake highly organic sandy loam; latitude 48.4241609, longitude -92.6776103, datum WGS84; UTM Zone 15, UTM Easting 523851 meters, UTM Northing 5363496 meters.

- A—0 to 8 centimeters; very dark brown (10YR 2/2) highly organic sandy loam; weak medium granular structure; very strongly acid.
- Bw1—8 to 18 centimeters; brown (10YR 4/3) loamy sand; weak medium subangular blocky structure; very strongly acid.
- Bw2—18 to 60 centimeters; dark yellowish brown (10YR 3/4) loamy sand; weak medium subangular blocky structure; strongly acid.
- 2Bt—60 to 85 centimeters; olive brown (2.5Y 4/3) stratified very fine sandy loam to silt loam to silty clay loam; moderate medium platy structure; grayish brown (10YR 5/2) iron depletions and brown (10YR 5/3) masses of oxidized iron; neutral.
- 2C—85 to 203 centimeters; light olive brown (2.5Y 5/3) stratified silt loam to silty clay loam to silty clay; massive; grayish brown (10YR 5/2) iron depletions and light olive brown (2.5Y 5/3) masses of oxidized iron; slightly alkaline.



Figure 35.—Profile of a Durkeelake soil. Saturation is at a depth of 115 centimeters. Scale is in centimeters.

## Eaglesnest Series

The Eaglesnest series consists of very deep, moderately well drained soils on bedrock-controlled moraines. Permeability is slow. Slopes range from 0 to 12 percent.

### Taxonomic Classification

Loamy-skeletal, isotic, frigid Oxyaquic Dystrudepts

### Typical Pedon

Eaglesnest highly organic gravelly sandy loam; latitude 48.4216806, longitude -92.8758417, datum WGS84; UTM Zone 15, UTM Easting 509186 meters, UTM Northing 5363177 meters.



- A—0 to 6 centimeters; black (10YR 2/1) highly organic gravelly sandy loam; moderate medium granular structure; 25 percent gravel and 5 percent cobbles; very strongly acid.
- Bw1—6 to 27 centimeters; dark yellowish brown (10YR 3/4) very gravelly sandy loam; weak medium subangular blocky structure; 5 percent stones, 10 percent cobbles, and 35 percent gravel; strongly acid.
- Bw2—27 to 42 centimeters; dark grayish brown (10YR 4/2) very gravelly sandy loam; weak fine subangular blocky structure; 5 percent stones, 10 percent cobbles, and 35 percent gravel; strongly acid.
- Bw3—42 to 79 centimeters; brown (10YR 4/3) and dark yellowish brown (10YR 4/4) gravelly sandy loam; weak medium subangular blocky structure; 1 percent stones, 5 percent cobbles, and 10 percent gravel; moderately acid.
- 2BC—79 to 98 centimeters; brown (10YR 4/3) very gravelly coarse sandy loam; weak medium subangular blocky structure; 10 percent cobbles and 35 percent gravel; moderately acid.
- 2Cd—98 to 200 centimeters; dark grayish brown (10YR 4/2) very cobbly coarse sandy loam; massive; 20 percent gravel and 25 percent cobbles; moderately acid.

## Fluvaquents

Fluvaquents consist of very deep, very poorly drained soils on drainageways on lake plains. Permeability is moderate. Slopes range from 0 to 2 percent.

### Taxonomic Classification

Fluvaquents

#### Typical Pedon

Fluvaquents mucky peat; latitude 48.4812606, longitude -92.8213915, datum WGS84; UTM Zone 15, UTM Easting 513199 meters, UTM Northing 5369808 meters.

Oe—0 to 15 centimeters; black (10YR 2/1) mucky peat; massive; very strongly acid.

A—15 to 25 centimeters; very dark brown (10YR 2/2) mucky loam; massive; slightly acid.

Cg—25 to 40 centimeters; grayish brown (10YR 4/2) loam; massive; slightly acid.

Ab—40 to 64 centimeters; very dark brown (10YR 2/2) mucky loam; massive; slightly acid.

2Cg—64 to 200 centimeters; grayish brown (10YR 4/2) stratified very cobbly loamy coarse sand to silt loam; massive; neutral.

## Foglake Series

The Foglake series consists of very deep, poorly drained soils on flats and drainageways on lake plains. Permeability is slow. Slopes range from 0 to 2 percent.

### Taxonomic Classification

Fine, smectitic, frigid Mollic Endoaqualfs

#### Typical Pedon

Foglake mucky peat; latitude 48.5849583, longitude -93.0384000, datum WGS84; UTM Zone 15, UTM Easting 497168 meters, UTM Northing 5381320 meters.

Oe—0 to 18 centimeters; very dark brown (10YR 2/2) mucky peat; very strongly acid.

A—18 to 20 centimeters; black (10YR 2/1) mucky silt loam; moderate medium granular structure; very strongly acid.

- Bg—20 to 38 centimeters; grayish brown (10YR 5/2) silty clay loam; moderate fine subangular blocky structure; 3 percent gray (10YR 6/1) iron depletions and 9 percent distinct yellowish brown (10YR 5/8) masses of oxidized iron; strongly acid.
- Btg—38 to 90 centimeters; light brownish gray (2.5Y 6/2) silty clay; moderate medium subangular blocky structure; 5 percent faint yellowish brown (10YR 5/6) masses of oxidized iron; neutral.
- BCg—90 to 115 centimeters; light olive gray (5Y 6/2) silty clay loam; moderate medium subangular blocky structure; 5 percent faint light gray (5Y 7/1) iron depletions and 10 percent faint yellowish brown (10YR 5/6) masses of oxidized iron; neutral.
- Cg—115 to 200 centimeters; light olive gray (5Y 6/2) silt loam; massive; 10 percent faint light gray (5Y 7/1) iron depletions and 15 percent faint yellowish brown (10YR 5/6) masses of oxidized iron; slightly effervescent; slightly alkaline.

## Greenwood Series

The Greenwood series consists of very deep, very poorly drained soils on acidic fens on lake plains. Permeability is rapid. Slopes are 0 to 1 percent.

### Taxonomic Classification

Dysic, frigid Typic Haplohemists

#### Typical Pedon (fig. 36)

Greenwood peat; latitude 48.4980535, longitude -93.0995470, datum WGS84; UTM Zone 15, UTM Easting 492646 meters, UTM Northing 5371664 meters.

Oi—0 to 20 centimeters; dark brown (7.5YR 3/2) peat; massive; extremely acid.

Oe—20 to 203 centimeters; very dark brown (10YR 2/2) mucky peat; massive; extremely acid.

## Grytal Series

The Grytal series consists of very deep, moderately well drained soils on flats on lake plains. Permeability is moderately rapid. Slopes range from 0 to 3 percent.

### Taxonomic Classification

Sandy, isotic, frigid Oxyaquic Eutrudepts

#### Typical Pedon

Grytal loamy sand; latitude 48.4581392, longitude -92.7488254, datum WGS84; UTM Zone 15, UTM Easting 518570 meters, UTM Northing 5367253 meters.

Oa—0 to 6 centimeters; very dark brown (10YR 2/2) highly decomposed plant material; very strongly acid.

E—6 to 11 centimeters; dark grayish brown (10YR 4/2) loamy sand; weak coarse subangular blocky structure; strongly acid.

Bw1—11 to 33 centimeters; brown (10YR 4/3) sand; weak coarse subangular blocky structure; strongly acid.

Bw2—33 to 68 centimeters; dark yellowish brown (10YR 4/4) coarse sand; single grain; very friable; 6 percent gravel; moderately acid.

Bw3—68 to 104 centimeters; brown (10YR 4/3) sand; single grain; very friable; 2 percent gravel; moderately acid.

C—104 to 200 centimeters; brown (10YR 4/3) fine sand; massive; very friable; 20 percent medium dark yellowish brown (10YR 4/6) masses of oxidized iron; 2 percent gravel; moderately acid.



Figure 36.—Sample of Greenwood soil. Scale is in centimeters.

## Hassman Series

The Hassman series consists of very deep, very poorly drained soils on drainageways and depressions on lake plains. Permeability is slow. Slopes are 0 to 1 percent.

### Taxonomic Classification

Fine, smectitic, nonacid, frigid Vertic Endoaquepts

### Typical Pedon

Hassman mucky loam; latitude 48.4245836, longitude -92.6772023, datum WGS84; UTM Zone 15, UTM Easting 523881 meters, UTM Northing 5363543 meters.

A—0 to 19 centimeters; black (10YR 2/1) mucky loam; very strongly acid.

AB—19 to 27 centimeters; dark brown (10YR 3/3) silty clay loam; 40 percent clay; moderate medium subangular blocky structure; strongly acid.

Bg1—27 to 46 centimeters; brown (10YR 4/3) silty clay loam; 40 percent clay; moderate medium subangular blocky structure; 3 percent distinct very dark

grayish brown (10YR 3/2) iron depletions on surfaces along root channels; slightly effervescent; slightly alkaline.

Bg2—46 to 74 centimeters; gray (2.5Y 6/1) silty clay loam; 40 percent clay; moderate medium subangular blocky structure; 10 percent medium prominent light yellowish brown (2.5Y 6/4) masses of oxidized iron; slightly effervescent; slightly alkaline.

BCg—74 to 152 centimeters; grayish brown (2.5Y 5/2) stratified silt loam to silty clay loam; 30 percent clay; massive; 20 percent prominent olive yellow (2.5Y 6/6) masses of oxidized iron in matrix; slightly effervescent; slightly alkaline.

Cg—152 to 200 centimeters; light brownish gray (2.5Y 6/2) stratified silt loam to silty clay loam; massive; slightly effervescent; slightly alkaline.

## Insula Series

The Insula series consists of shallow, well drained soils on bedrock-controlled moraines. Permeability is moderately rapid. Slopes range from 2 to 35 percent. The Insula soils in Voyageurs National Park are considered taxadjuncts because they have more rock fragments than is specified in the range of characteristics for the series.

### Taxonomic Classification

Loamy, isotic, frigid Lithic Dystrudepts

#### Typical Pedon (fig. 37)

Insula sandy loam; latitude 48 degrees 17 minutes 34.84 seconds N. and longitude 92 degrees 13 minutes 2.24 seconds W., datum WGS84; UTM Zone 15, UTM Easting 558055 meters, UTM Northing 5349164 meters.

Oe—0 to 4 centimeters; moderately decomposed plant material; very strongly acid.

A—4 to 10 centimeters; very dark grayish brown (10YR 3/2) sandy loam; moderate medium granular structure; 6 percent gravel; strongly acid.

Bw1—10 to 18 centimeters; dark brown (10YR 3/3) cobbly sandy loam; moderate fine subangular blocky structure; 6 percent gravel and 10 percent cobbles; strongly acid.

Bw2—18 to 29 centimeters; dark yellowish brown (10YR 3/4) sandy loam; moderate fine subangular blocky structure; 8 percent gravel; strongly acid.

2R—29 to 200 centimeters; bedrock.

## Little Swan Series

The Little Swan series consists of very deep, somewhat poorly drained soils on flats on lake plains. Permeability is moderately slow. Slopes range from 0 to 3 percent.

### Taxonomic Classification

Fine-silty, mixed, superactive, frigid Aquollic Hapludalfs

#### Typical Pedon (fig. 38)

Little Swan silt loam; latitude 48.4222778, longitude -92.8446861, datum WGS84; UTM Zone 15, UTM Easting 511491 meters, UTM Northing 5363248 meters.

Oe—0 to 6 centimeters; black (10YR 2/1) moderately decomposed plant material; very strongly acid.

A—6 to 16 centimeters; black (10YR 2/1) silt loam; weak medium granular structure; very strongly acid.

E—16 to 25 centimeters; weak red (2.5YR 4/2) silt loam; moderate medium platy structure; strongly acid.





**Figure 37.—Profile of an Insula soil. Coarse-loamy till overlies bedrock. Scale is in centimeters.**

Bt—25 to 63 centimeters; reddish brown (2.5YR 5/3) silt loam; moderate medium subangular blocky structure; 1 percent fine faint red (2.5YR 4/2) iron depletions and 3 percent fine distinct strong brown (7.5YR 5/6) masses of oxidized iron; strongly acid.

2Bkg—63 to 100 centimeters; variegated 90 percent red (2.5YR 4/2) and 10 percent pale red (2.5YR 7/2) silty clay loam; massive; 5 percent fine distinct iron-manganese masses; 2 percent fine distinct light reddish gray (2.5YR 7/1) carbonate masses; slightly effervescent; slightly alkaline.

Cg—100 to 200 centimeters; variegated 90 percent red (2.5YR 4/2) and 10 percent red (2.5YR 5/2) silty clay loam; massive; 5 percent fine distinct iron-manganese masses; slightly effervescent; slightly alkaline.

## Merwin Series

The Merwin series consists of very deep, very poorly drained soils on acidic fens on lake plains. Permeability is moderately slow. Slopes are 0 to 1 percent.

### Taxonomic Classification

Loamy, mixed, dysic, frigid Terric Haplohemists

### Typical Pedon

Merwin peat; latitude 48.6139583, longitude -93.1124611, datum WGS84; UTM Zone 15, UTM Easting 491711 meters, UTM Northing 5384549 meters.

Oi—0 to 25 centimeters; very dark brown (7.5YR 2.5/2) peat; massive; extremely acid.

Oe—25 to 60 centimeters; black (10YR 2/1) mucky peat; massive; extremely acid.

A—60 to 64 centimeters; black (10YR 2/1) silty clay loam; massive; very strongly acid.

Cg—64 to 200 centimeters; dark greenish gray (10GY 4/1) stratified silty clay loam to silty clay; massive; strongly acid.



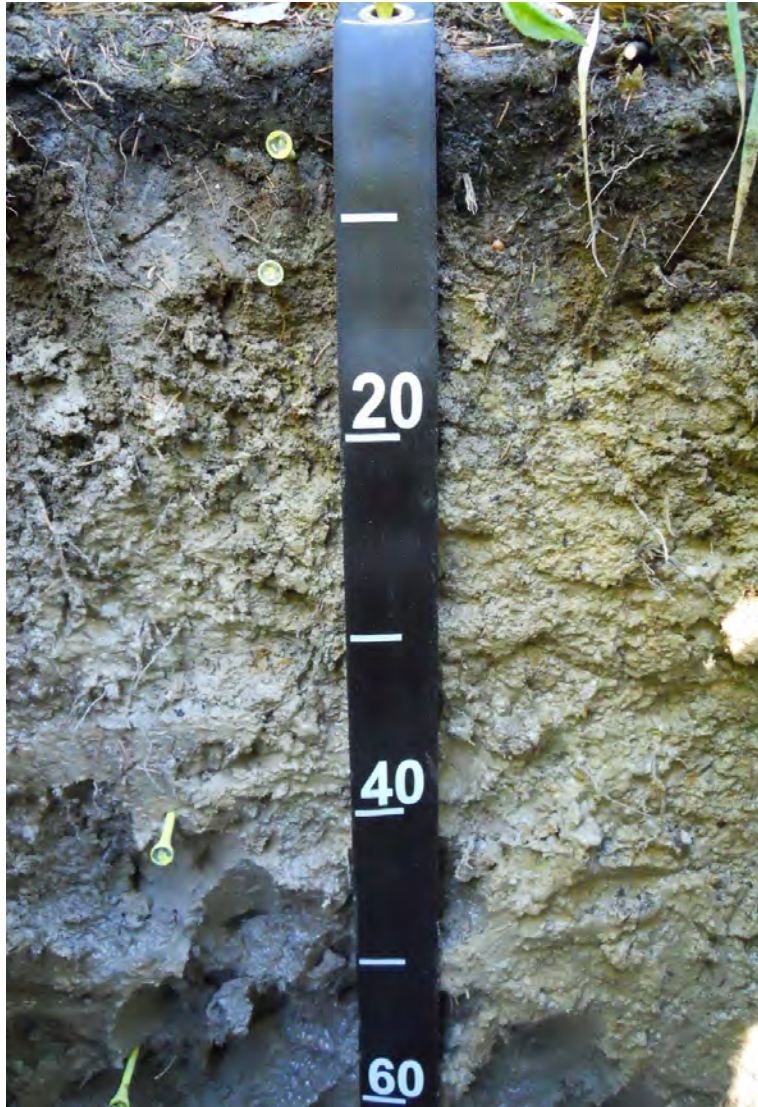


Figure 38.—Profile of a Little Swan soil. Scale is in centimeters.

## Metonga Series

The Metonga series consists of moderately deep, well drained soils on bedrock-controlled moraines. Permeability is moderately rapid. Slopes range from 0 to 12 percent. The Metonga soils in Voyageurs National Park are considered taxadjuncts because they have more rock fragments than is specified in the range of characteristics for the series.

### Taxonomic Classification

Loamy-skeletal, isotic, frigid Typic Haplorthods

### Typical Pedon

Metonga highly organic very cobbly sandy loam; latitude 48.4228056, longitude -92.6841306, datum WGS84; UTM Zone 15, UTM Easting 523369 meters, UTM Northing 5363343 meters.

- A—0 to 12 centimeters; very dark brown (7.5YR 2.5/2) highly organic very cobbly sandy loam; moderate fine granular structure; 15 percent gravel and 40 percent cobbles; very strongly acid.
- Bhs—12 to 41 centimeters; dark brown (7.5YR 3/2) very cobbly sandy loam; weak medium subangular blocky structure; 15 percent gravel and 40 percent cobbles; very strongly acid.
- Bw—41 to 61 centimeters; dark grayish brown (10YR 4/2) gravelly sandy loam; weak medium subangular blocky structure; 10 percent cobbles and 20 percent gravel; strongly acid.
- R—61 to 200 centimeters; bedrock.

## Mooselake Series

The Mooselake series consists of very deep, very poorly drained soils on cedar fens on lake plains. Permeability is rapid. Slopes are 0 to 1 percent.

### Taxonomic Classification

Euic, frigid Typic Haplohemists

### Typical Pedon

Mooselake mucky peat; latitude 48.3926333, longitude -92.9105889, datum WGS84; UTM Zone 15, UTM Easting 506619 meters, UTM Northing 5359945 meters.

- Oe1—0 to 60 centimeters; black (10YR 2/1) mucky peat; massive; 1 percent wood fragments; moderately acid.
- Oe2—60 to 120 centimeters; black (10YR 2/1) mucky peat; massive; 3 percent wood fragments; moderately acid.
- Oe3—120 to 200 centimeters; black (10YR 2/1) mucky peat; massive; 4 percent wood fragments; moderately acid.

## Quetico Series

The Quetico series consists of very shallow, well drained soils on bedrock-controlled moraines. Permeability is moderately rapid. Slopes range from 2 to 35 percent. The Quetico soils in Voyageurs National Park are considered taxadjuncts because they have more rock fragments than is specified in the range of characteristics for the series.

### Taxonomic Classification

Loamy, isotic, acid, frigid Lithic Udorthents

### Typical Pedon (fig. 39)

Quetico fine sandy loam; latitude 48.2237473, longitude -92.0916372, datum WGS84; UTM Zone 15, UTM Easting 567466 meters, UTM Northing 5341568 meters.

- Oe—0 to 1 centimeter; black (10YR 2/1) moderately decomposed plant material; very strongly acid.
- A—1 to 5 centimeters; black (10YR 2/) fine sandy loam; moderate medium granular structure; 5 percent gravel and 5 percent cobbles; very strongly acid.
- Bw—5 to 20 centimeters; brown (10YR 4/3) gravelly fine sandy loam; weak fine subangular blocky structure; 5 percent cobbles and 15 percent gravel; strongly acid.
- 2R—20 to 200 centimeters; bedrock.



Figure 39.—Profile of a Quetico soil. Bedrock is at a depth of 12 centimeters. Scale is in centimeters.

## Rifle Series

The Rifle series consists of very deep, very poorly drained soils on fens on lake plains. Permeability is moderately rapid. Slopes are 0 to 1 percent.

### Taxonomic Classification

Euic, frigid Typic Haplohemists

### Typical Pedon

Rifle peat; latitude 48.4776861, longitude -92.8916556, datum WGS84; UTM Zone 15, UTM Easting 508007 meters, UTM Northing 5369401 meters.

Oi—0 to 30 centimeters; black (10YR 2/1) peat; massive; very strongly acid.

Oe1—30 to 75 centimeters; very dark brown (7.5YR 2.5/2) mucky peat; massive; very strongly acid.

Oe2—75 to 200 centimeters; black (10YR 2/1) mucky peat; massive; very strongly acid.

## Sax Series

The Sax series consists of very deep, very poorly drained soils on depressions on lake plains (fig. 40). Permeability is moderate. Slopes are 0 to 1 percent.

### Taxonomic Classification

Fine-silty, mixed, superactive, nonacid, frigid Histic Humaquepts





Figure 40.—An area of Sax ponded, very poorly drained soil with sedge vegetation.

#### Typical Pedon (fig. 41)

Sax muck; latitude 48.4281041, longitude -92.9994458, datum WGS84; UTM Zone 15, UTM Easting 500224 meters, UTM Northing 5363852 meters.

Oa—0 to 40 centimeters; black (10YR 2/1) muck; moderately acid.

A—40 to 43 centimeters; black (10YR 2/1) mucky silt loam; moderate medium granular structure; slightly acid.

Bg—43 to 70 centimeters; dark gray (5Y 4/1) silt loam; moderate fine angular blocky structure; neutral.

Cg—70 to 200 centimeters; dark gray (5YR 4/1) silt loam; massive; strongly effervescent; moderately alkaline.

### Spooner Series

The Spooner series consists of very deep, poorly drained soils on flats and drainageways on lake plains. Permeability is moderately slow. Slopes range from 0 to 2 percent.

#### Taxonomic Classification

Fine-silty, mixed, superactive, frigid Mollic Endoaqualfs

#### Typical Pedon

Spooner mucky silt loam; latitude 48.4672024, longitude -92.9895156, datum WGS84; UTM Zone 15, UTM Easting 500775 meters, UTM Northing 5368230 meters.

A—0 to 15 centimeters; black (10YR 2/1) mucky silt loam; very strongly acid.



**Figure 41.—Auger tailings of ponded Sax soil laid out on sedges. Organic deposits extend to a depth of 40 centimeters. The A horizon, at a depth of 40 to 52 centimeters, overlies lacustrine layers. Scale is in centimeters.**

- AE—15 to 25 centimeters; dark grayish brown (10YR 4/2) silt loam; weak medium subangular blocky structure; strongly acid.
- Eg—25 to 40 centimeters; dark gray (2.5Y 4/1) silty clay loam; weak thick platy structure; strongly acid.
- Btg—40 to 70 centimeters; dark gray (2.5Y 4/1) silty clay loam; moderate fine angular blocky structure; 1 percent fine faint dark gray (2.5Y 4/1) iron depletions and 1 percent fine prominent dark yellowish brown (10YR 4/6) masses of oxidized iron; neutral.
- Bkg—70 to 100 centimeters; light brownish gray (2.5Y 6/2) silt loam; moderate fine angular blocky structure; 4 percent medium prominent dark yellowish brown (10YR 4/6) masses of oxidized iron; medium prominent light gray (10YR 7/1) carbonate masses; strongly effervescent; moderately alkaline.
- C—100 to 200 centimeters; light olive brown (2.5Y 5/3) stratified silt loam to silty clay loam; massive; medium faint grayish brown (2.5Y 5/2) and medium distinct gray (2.5Y 6/1) iron depletions and 25 percent medium prominent dark yellowish brown (10YR 4/6) masses of oxidized iron; strongly effervescent; moderately alkaline.



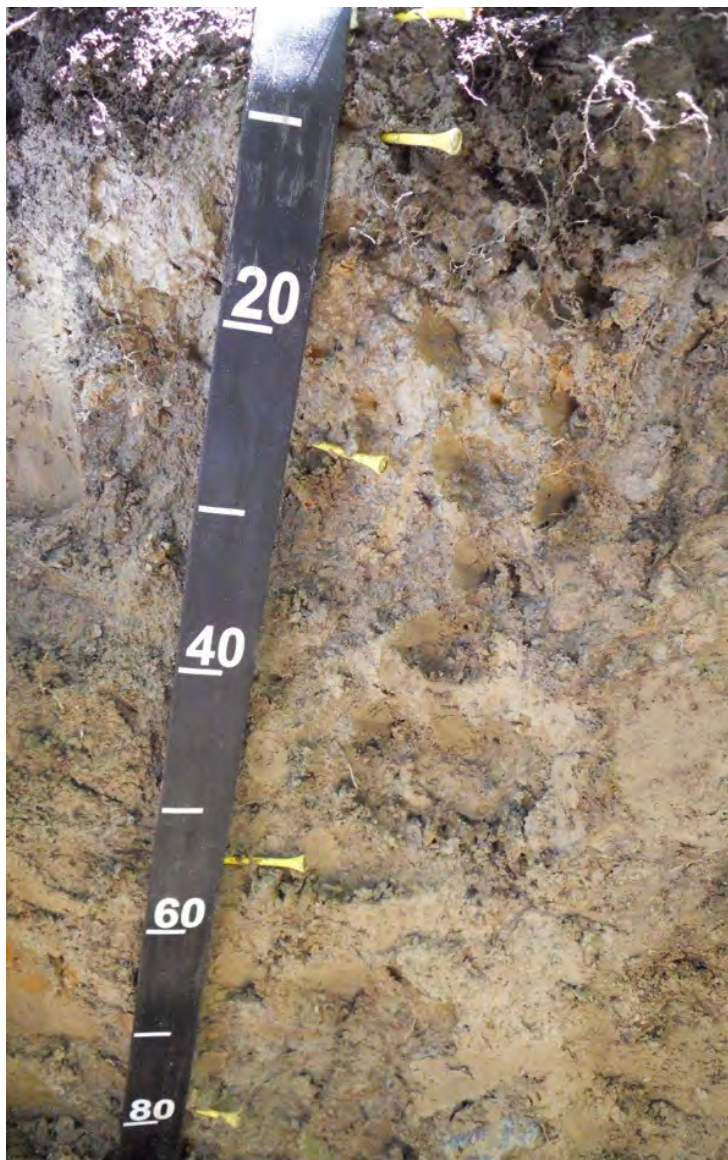


Figure 42.—Profile of Spooner taxadjunct. Lacustrine subsoil horizons of silt loam and silty clay loam overlie cobbly sandy loam at a depth of 82 centimeters. Bedrock is at a depth of 85 centimeters. Scale is in centimeters.

## Spooner Taxadjunct

The Spooner taxadjunct consists of deep, poorly drained soils on flats and drainageways on lake plains. Permeability is moderately slow. Slopes range from 0 to 3 percent.

### Taxonomic Classification

Fine-silty, mixed, superactive, frigid Mollic Endoaqualfs

### Typical Pedon (fig. 42)

Spooner mucky peat; latitude 48.5298111, longitude -92.7879611, datum WGS84; UTM Zone 15, UTM Easting 515655 meters, UTM Northing 5375211 meters.



**Figure 43.—An area of Tacoosh soils. These soils formed from organic deposits over clay loam in fens on lake plains.**

- Oe—0 to 4 centimeters; black (7.5YR 2.5/1) mucky peat; very strongly acid.  
A—4 to 14 centimeters; black (10YR 2/1) silt loam; moderate medium granular structure; very strongly acid.  
Eg—14 to 35 centimeters; dark grayish brown (10YR 4/2) silty clay loam; weak fine subangular blocky structure; 20 percent strong brown (7.5YR 4/6) iron-manganese masses; strongly acid.  
Btg—35 to 70 centimeters; dark gray (10YR 4/1) silty clay; weak medium prismatic structure parting to weak medium subangular blocky; neutral.  
2Cg—70 to 107 centimeters; grayish brown (2.5Y 5/2) gravelly loam; massive; 15 percent strong brown (7.5YR 4/6) iron-manganese masses; 5 percent cobbles and 10 percent gravel; neutral.  
R—107 to 200 centimeters; bedrock.

## **Tacoosh Series**

The Tacoosh series consists of very deep, very poorly drained soils on fens on lake plains (fig. 43). Permeability is moderately slow. Slopes are 0 to 1 percent.

### **Taxonomic Classification**

Loamy, mixed, euic, frigid Terric Haplohemists

### **Typical Pedon**

Tacoosh peat; latitude 48.4759690, longitude -92.8203006, datum WGS84; UTM Zone 15, UTM Easting 513281 meters, UTM Northing 5369220 meters.

Oi—0 to 25 centimeters; black (10YR 2/1) peat; very strongly acid.

Oe—25 to 125 centimeters; black (10YR 2/1) mucky peat; very strongly acid.

A—125 to 135 centimeters; very dark brown (10YR 2/2) loam; weak fine granular structure; strongly acid.

Cg—135 to 200 centimeters; grayish brown (10YR 5/2) clay loam; massive; 20 percent yellowish brown (10YR 5/6) masses of oxidized iron; slightly alkaline.

## Udipsamments

Udipsamments consist of very deep, somewhat excessively drained soils on hillslopes on lake plains. Permeability is rapid. Slopes range from 0 to 12 percent.

### Taxonomic Classification

Udipsamments

#### Typical Pedon (fig. 44)

Udipsamments fine sand; latitude 48.4700374, longitude -92.8495983, datum WGS84; UTM Zone 15, UTM Easting 511117 meters, UTM Northing 5368556 meters.

A—0 to 7 centimeters; very dark grayish brown (10YR 3/2) fine sand; moderate medium granular structure; strongly acid.

E—7 to 9 centimeters; brown (10YR 4/3) fine sand; weak medium subangular blocky structure; strongly acid.

Bw—9 to 40 centimeters; yellowish brown (10YR 5/6) fine sand; weak medium subangular blocky structure; strongly acid.

E'—40 to 72 centimeters; light yellowish brown (2.5Y 6/3) fine sand; weak medium subangular blocky structure; moderately acid.

E and Bt—72 to 113 centimeters; light olive brown (2.5Y 5/6) fine sand with thin lamellae of loamy fine sand; weak medium subangular blocky structure; moderately acid.

C1—113 to 133 centimeters; light olive brown (2.5Y 5/4) sand; massive; moderately acid.

C2—133 to 203 centimeters; light olive brown (2.5Y 5/3) fine sand; massive; fine light olive brown (2.5Y 5/6) masses of oxidized iron; moderately acid.

## Voyageurs Series

The Voyageurs series consists of deep, somewhat poorly drained soils on flats on lake plains. Permeability is moderately slow. Slopes range from 0 to 5 percent.

### Taxonomic Classification

Fine, smectitic, frigid Aquic Glossudalfs

#### Typical Pedon (fig. 45)

Voyageurs highly organic silt loam; latitude 48.4741069, longitude -92.8520216, datum WGS84; UTM Zone 15, UTM Easting 510937 meters, UTM Northing 5369008 meters.

A—0 to 7 centimeters; black (10YR 2/1) highly organic silt loam, very dark gray (10YR 3/1) dry; weak medium granular structure; friable; 1 percent gravel; very strongly acid; clear smooth boundary.

E—7 to 17 centimeters; light yellowish brown (2.5Y 6/3) silt loam, light gray (10YR 7/1) dry; weak medium subangular blocky structure; friable; 1 percent gravel; strongly acid; abrupt wavy boundary.





Figure 44.—Profile of Udipsamments, which formed in inextensive fine sand with bisequum horizonation. Scale is in centimeters.

E/B—17 to 30 centimeters; 60 percent light yellowish brown (2.5Y 6/3) silt loam and 40 percent olive brown (2.5Y 4/3) silty clay loam, 60 percent light gray (10YR 7/1) and 40 percent pale brown (10YR 6/3) dry; moderate medium prismatic structure parting to strong medium angular blocky; firm; 1 percent dark brown (10YR 3/3) clay films on faces of peds; 1 percent fine faint light gray (2.5Y 7/2) iron depletions and 2 percent fine prominent yellowish brown (10YR 5/6) masses of oxidized iron; 1 percent gravel; strongly acid; clear irregular boundary.

Bt—30 to 70 centimeters; olive brown (2.5Y 4/3) silty clay loam; moderate medium prismatic structure parting to strong medium angular blocky; firm; 1 percent dark brown (10YR 3/3) clay films on faces of peds; 1 percent fine prominent dark brown (7.5YR 3/3) masses of oxidized iron and 1 percent fine faint light gray (2.5Y 7/2) iron depletions; very cobbly at the discontinuity lag-line; 1 percent gravel; neutral; gradual wavy boundary.



**Figure 45.—Profile of a Voyageurs soil. The water table occurs in dull-colored, calcareous Lake Agassiz sediments. The sediments overlie dense fragmental till and bedrock. Scale is in centimeters.**

2C—70 to 140 centimeters; light olive brown (2.5Y 5/3) very gravelly loamy sand; loose; 1 percent fine faint light gray (2.5Y 7/2) iron depletions and 2 percent fine prominent yellowish brown (10YR 5/6) masses of oxidized iron; 5 percent stones, 10 percent cobbles, and 25 percent gravel; slightly alkaline; abrupt wavy boundary.  
3R—140 to 200 centimeters; bedrock.

## **Voyageurs Taxadjunct**

The Voyageurs taxadjunct consists of deep, moderately well drained soils on slight rises on lake plains. Permeability is moderately slow. Slopes range from 0 to 8 percent.

### **Taxonomic Classification**

Fine, smectitic, frigid Oxyaquic Glossudalfs

#### **Typical Pedon**

Voyageurs silt loam; latitude 48.4247306, longitude -92.7862139, datum WGS84; UTM Zone 15, UTM Easting 512517 meters, UTM Northing 5367803 meters.

Oe—0 to 5 centimeters; black (7.5YR 2.5/1) moderately decomposed plant material.

A—5 to 8 centimeters; very dark brown (7.5YR 2.5/2) silt loam; moderate medium granular structure; very strongly acid.

E/B—8 to 22 centimeters; dark grayish brown (2.5Y 4/2) silt loam and silty clay loam; moderate medium subangular blocky structure; strongly acid.





Figure 46.—Profile of a Wahlsten soil. Redoxomorphic features occur at a depth of 28 to 78 centimeters. Bedrock is at a depth of 78 centimeters. Scale is in centimeters.

Bt—22 to 76 centimeters; olive brown (2.5Y 4/3) silty clay loam; strong coarse subangular blocky structure; moderately acid.

C1—76 to 87 centimeters; olive brown (2.5Y 4/3) stratified silt loam to silty clay loam; massive; neutral.

2C2—87 to 91 centimeters; dark brown (7.5YR 3/2) coarse sand; massive; 5 percent gravel; neutral.

R—91 to 200 centimeters; bedrock.

## Wahlsten Series

The Wahlsten series consists of moderately deep, moderately well drained soils on bedrock-controlled moraines. Permeability is moderate. Slopes range from 1 to 8 percent. The Wahlsten soils in Voyageurs National Park are considered taxadjuncts because they have more rock fragments than is specified in the range of characteristics for the series.

### Taxonomic Classification

Coarse-loamy, isotic, frigid Oxyaquic Dystrudepts

**Typical Pedon** (fig. 46)

Wahlsten very cobbly fine sandy loam; latitude 48.0862099, longitude -91.0499345, datum WGS84; UTM Zone 15, UTM Easting 578199 meters, UTM Northing 5326415 meters.

Oe—0 to 5 centimeters; very dark grayish brown (10YR 3/2) moderately decomposed plant material; very strongly acid.

A—5 to 8 centimeters; very dark grayish brown (10YR 3/2) very cobbly fine sandy loam; moderate medium granular structure; 2 percent stones, 10 percent gravel, and 30 percent cobbles; very strongly acid.

Bw1—8 to 28 centimeters; dark yellowish brown (10YR 3/4) very cobbly fine sandy loam; moderate fine subangular blocky structure; 2 percent stones, 10 percent gravel, and 30 percent cobbles; strongly acid.

Bw2—28 to 69 centimeters; dark yellowish brown (10YR 4/4) very gravelly sandy loam; weak fine subangular blocky structure; 40 percent gravel; strongly acid.

2BC—69 to 94 centimeters; yellowish brown (10YR 5/4) very gravelly sandy loam; weak coarse subangular blocky structure; 8 percent coarse dark yellowish brown (10YR 4/4) masses of oxidized iron and 25 percent medium iron depletions; 50 percent gravel; moderately acid.

3R—94 to 200 centimeters; bedrock.



# Formation of the Soils

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This section relates the soils in Voyageurs National Park to the major factors of soil formation. It also discusses the processes of horizon differentiation.

## Factors of Soil Formation

Soil is a three-dimensional natural body consisting of mineral and organic material that can support plant growth. The characteristics of a soil at any given site are influenced by five major factors—parent material, climate, plants and animals, relief, and time (Jenny, 1941). Climate, plants, and animals have an effect on parent material that is modified by relief over time. Theoretically, if all these factors were the same at different sites, the soils at these sites would be identical. Differences among the soils are caused by variations in one or more of these factors.

### Parent Material

Parent material is the organic or mineral earthen material in which soils form. It determines soil texture, which in turn affects other properties, such as natural soil drainage and permeability. The physical and chemical composition of parent material has an important influence on the kind of soil that forms.

Most of the soils in Voyageurs National Park formed in coarse-loamy glacial till deposited during the last glaciation. This glacial till was later modified and reworked by Glacial Lake Agassiz, which covered the area after the glacier receded. In some areas, the glacial till has a high content of rock fragments (fig. 47).

The soils in many of the drainageways and depressions formed primarily in material deposited by the waters of Glacial Lake Agassiz. Lacustrine silt and clay were deposited in low areas or on footslopes. Voyageurs, Spooner, and Brickton soils formed in these lacustrine deposits. The lacustrine deposits have calcium carbonate (fig. 48), inherent from the parent material, which affects the pH of the soil.

Organic soils occur throughout Voyageurs National Park and cover approximately 15 percent of the land mass area. These soils formed in herbaceous and woody plant remains. The accumulation of organic material can be substantial. At a site within the park that was sampled for the Koochiching Peatland Inventory, in the bog west of Kabetogama Lake, the soil has more than 5 meters of organic deposits (figs. 49 and 50).

Alluvium is soil material deposited by floodwater along streams. The texture of the material varies, depending on the speed of the floodwater, the duration of flooding, and the distance from the streambank. Soils that formed in recent alluvium can be stratified. The source of the alluvium generally is material eroded from other soils farther upstream in the watershed.

### Climate

Climatic factors, such as precipitation and temperature, affect soil-forming processes. They influence the existing plant and animal communities, the





Figure 47.—Glacial till that has a high content of rock fragments.

evapotranspiration rates, water tables, and the physical and chemical weathering of parent material.

Voyageurs National Park has a cool, subhumid climate. There is a wide variation in temperature between summer and winter. The hotter summer temperatures affect evapotranspiration; the soil's water table level subsides even with the relatively high amounts of midsummer rainfall, as most water is drawn up by trees and vegetation (fig. 51). During the winter, soil-forming processes, except for the effects of frost action, are essentially suspended. Soil may be frozen to a depth of 3 to 4 feet.

Because of short summers, long winters, and humid conditions, the rate that organic material accumulates is faster than the decomposition rate. In low-lying landscape positions and under water-saturated conditions, the supply of oxygen is limited and micro-organisms that thrive in anaerobic conditions decompose the plant remains. The process of anaerobic decomposition is much slower than aerobic oxidation. The accumulating organic material forms Histosols.





**Figure 48.—Carbonate-rich deposits from Glacial Lake Agassiz react as hydrochloric acid is dripped onto a ped.**

Climate has the most pronounced effect on soil-forming processes during the growing season. The amount of rainfall influences the rate at which soluble and colloidal materials are removed from the upper part of the soil profile and deposited in the lower part.

## **Plants and Animals**

The vegetation under which a soil forms influences soil properties, such as color, structure, reaction, and the content and distribution of organic matter. Vegetation extracts water from the soil, recycles nutrients, and adds organic material to the soil as organic residues decompose. Gases derived from root respiration combine with water to form acids that influence the weathering of minerals. Because of a lower content of organic matter, soils that formed under forest vegetation are generally lighter colored than those that formed under grasses.

Logging in the survey area in the late 1800s and early 1900s removed much of the white pine and red pine. The regrowth of pines has produced much smaller stands. The park is in a transition area between the temperate deciduous forest to the south and the boreal forest to the north (Graham, 2007). Consequently, it has a variety of tree species (fig. 52).

Bacteria, fungi, and many micro-organisms decompose organic material and release nutrients to growing plants. Fungi and earthworms also influence the formation of peds. Soil properties, such as drainage, temperature, and reaction, influence the type of micro-organisms that live in the soil. Microbes participate in many of the organic and chemical interactions in the soil that are vital to the support of higher plants.

Peatland acidification is a result of microbial decay of organic material, cation exchange induced by sphagnum moss, and, to a lesser degree, input of acids from the

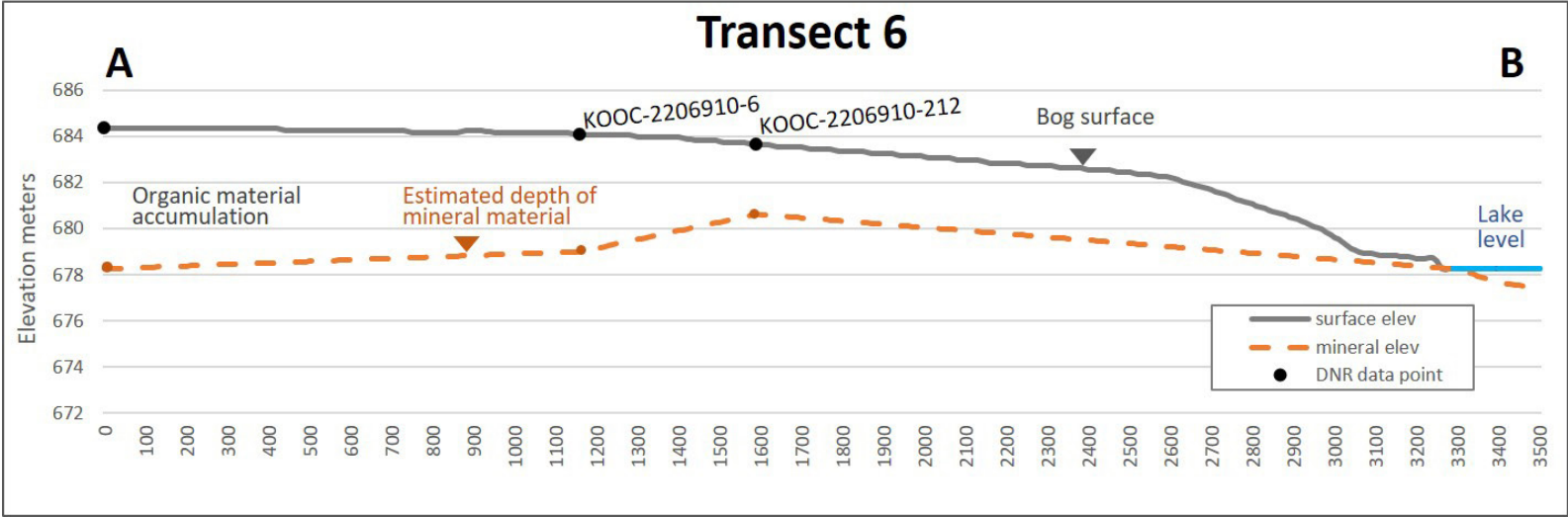


Figure 49.—Transect 6 shows three deep sample points from the peatland inventory by the Minnesota Department of Natural Resources that document the depth of organic material over mineral earthen material in the southwest corner of Voyageurs National Park. The depth of mineral substratum is estimated across the transect, with depths measured at the three points and with mineral material assumed to be near the surface at the shore line of the lake. The transect shows the depth of peat over the landscape with measured depths of 6, 5, and 3 meters at the points along the transect A to B (data source: <http://www.lmic.state.mn.us/chouse/metadata/peatinv.html#eainfo>). See appendix 4 for data on transect 6.



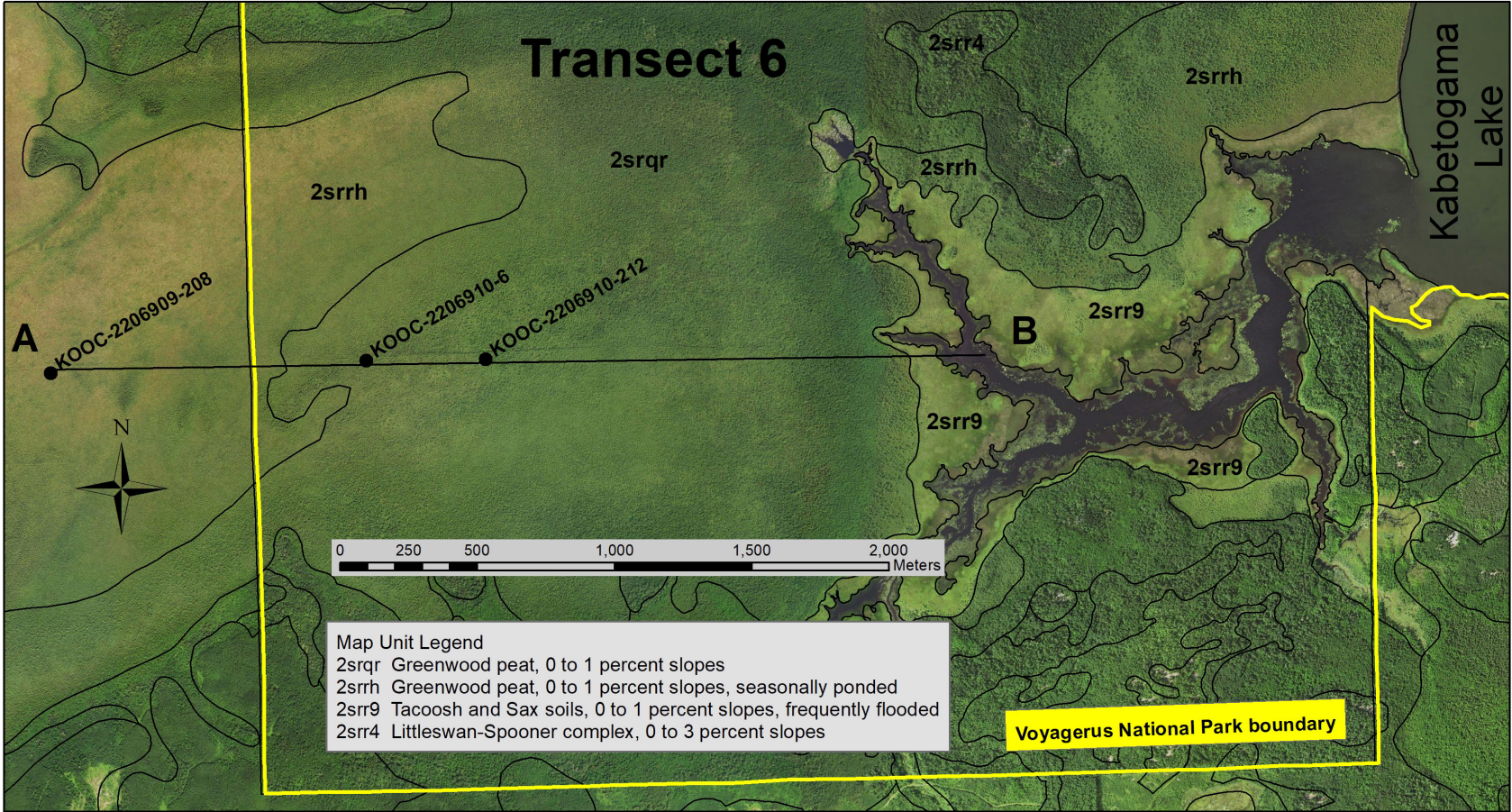
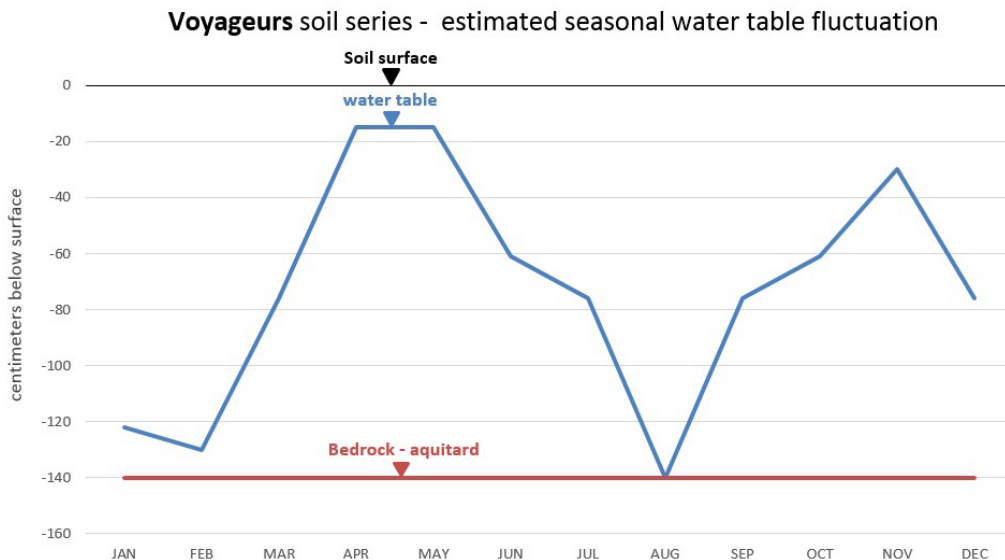


Figure 50.—Aerial image of Kabetogama Lake showing locations of transect 6. The nearshore map unit 2srrb is frequently flooded with a perennially high water table. See appendix 4 for data on transect 6.





**Figure 51.—Estimated fluctuation of seasonal high water table for Voyageurs, somewhat poorly drained soil. The seasonal high water table is estimated to be at a depth of 15 centimeters in spring. The water table is estimated to recede to the depth of bedrock (about 140 centimeters) in August.**



**Figure 52.—A forested landscape in northern Minnesota. The mixed boreal tree species include spruce, balsam fir, and paper birch.**



**Figure 53.—Black spruce in an acidic bog.**

atmosphere (Priest, 2012). Microbial decomposition of dead plant material produces organic acids. Sphagnum moss can grow in material low in nutrients and dominate peatlands. The moss acidifies the soil by cation exchange as it adsorbs base cations, such as calcium and magnesium, and releases hydrogen ions (Priest, 2012). Under these acidifying conditions, only species tolerant of low-nutrient and acidic soil conditions can exist; the plant community consists dominantly of black spruce (fig. 53), sphagnum moss, leatherleaf, Labrador tea, cottongrass, pitcherplant, and few other species.

Plant communities can vary widely in organic soils. Reeds, sedges, leatherleaf, and alder can grow where the water table is perennially at or close to the surface in open marshes. Organic soils develop a “hump and hole” microrelief where mosses and cottongrass establish on top of accumulations of sedges. Once a network of organic matter starts to accumulate slightly above the water table, trees can begin to grow and so increase plant transpiration to the water table. Dense forests of tamarack, white cedar, or black spruce thrive where tree roots can remain above the water table. Beaver activity, however, can return of the area back to an open marsh; their dams raise the water level and can drown the trees.

The aerial photography of figures 54a and 54b shows organic map units that are ponded with no forested overstory and map units with wooded vegetation where the water table is not at or above the surface for long periods. The red arrows indicate the direction of hydrologic flow, which adds nutrients to the Rifle soil. The more acidic Greenwood soil receives less flow.

In the color-infrared photography of figure 54b, vegetation, which is a strong reflector of infrared radiation, appears bright red. Water, which absorbs infrared wavelength, appears dark.



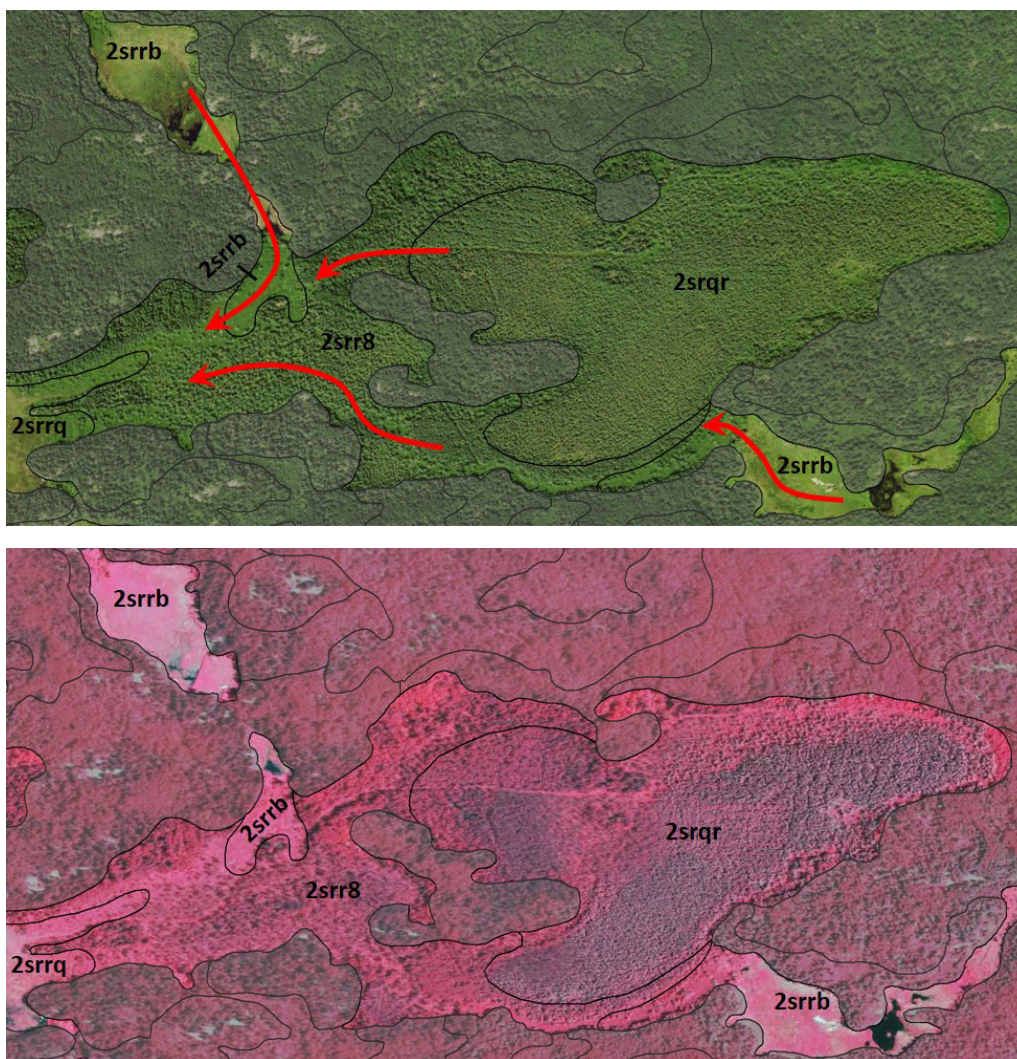


Figure 54a (top).—Aerial photography (visible light-wave reflection) of lowlands within a watershed in Voyageurs National Park. Imagery shown at 1:5000 scale. Figure 54b (bottom).—Color-infrared photography of same area in figure 54a. Imagery shown at 1:5000 scale. Unlabeled upland soils are grayed out. Map unit symbols and names:

- 2srqr Greenwood peat, 0 to 1 percent slopes
- 2srr8 Rifle mucky peat, 0 to 1 percent slopes
- 2srrb Aquents, Sax, and Tacoosh soils, 0 to 1 percent slopes, ponded
- 2srrq Cathro and Tacoosh soils, 0 to 1 percent slopes, ponded

The image of visible light-wave reflection (fig. 54a) is contrasted with the infrared photography (fig. 54b) to differentiate the Greenwood soil (with black spruce vegetation) from the Rifle soil (with an overstory of mixed tamarack, white cedar, and black spruce).

## Relief

Relief influences soil formation through its effect on hydrology, runoff, and erosion. Slope aspect can also influence soil temperature and plant cover. Relief can differentiate soils that formed in the same kind of parent material because of its effect on depth and duration of the water table. Water that runs off the more sloping





**Figure 55.—Bedrock-controlled topography results in a very uneven and rugged land surface.**

soils can collect in depressions or swales. The moderately well drained Baudette and poorly drained Spooner soils both formed in silty lacustrine sediments. The Baudette soil has a browner subsoil because it has better aeration, which allows iron to oxidize. The Spooner soil has a gray subsoil because of saturation, which causes iron to be reduced to a soluble form that is then depleted from the profile.

The rolling topography of Voyageurs National Park is controlled by the uneven bedrock surface, much of which is only thinly covered with earthen material (fig. 55). The average slope within the park (excluding areas of water) is 8 percent. The average slope of the mineral soils (excluding organic soils) is 10 percent. Most mineral soils (64 percent) have slopes between 1 and 12 percent. Due to the irregularity of the bedrock surface, 15 percent of the land within the park has slopes of more than 18 percent. The bedrock controls the hydrology of the soils, perching the water table; the water flows laterally off the landscape into the lakes and lowlands.

Relief also affects the formation of organic soils. Peatlands form through two major processes, lakefill and paludification, which are related to position on the landform (Severson et al., 1980). Lakefill occurs when organic matter accumulating at the margins of a lake or pond eventually fills the basin. Paludification is the process of peat accumulation that spreads outward across a flat, poorly drained landscape and upward into low-lying, poorly drained areas, forming large areas with a continuous blanket of peat (Lavoie et al., 2005).

The local hydrology can affect the nutrient influx into the peatland and support a more diverse plant community. Without additions of nutrients, bogs can acidify and the diversity of the plant community can become limited, dominated by black spruce and sphagnum mosses (fig. 53). Over many years, the mosses can accumulate enough organic material to form a slightly elevated dome, known as a raised bog, that is only fed by precipitation and is above the effects of ground-water influx.



**Figure 56.—View of an O horizon (about 4 centimeters thick) that consists of partially decomposed leaf and pine needle detritus. The O horizon occurs in soils in uplands of coarse-loamy glacial till.**

## Time

Soil-forming processes need time to develop morphologically identifiable features. It may take decades to form identifiable redoxomorphic features, hundreds of years to form spodic properties, and thousands of years to form well defined argillic horizons. Soil-forming processes have been active for only 9,000 to 12,000 years in the survey area, which, on a geologic timescale, is short. As a result, the soils have a thinner profile than soils that formed on older landscapes.

Peatlands have been sequestering carbon since the end of the last ice age, but most of the accumulation of organic matter has occurred since 5,000 years before present, when the climate became more humid (Gorham, 1991). Table 19 shows the estimated amount of organic carbon in representative soil profiles. Based on the map unit acres in table 5, the organic carbon stored to a depth of 2 meters in just the peatland soils of the park is 10,559,634 metric tons (1.16 million U.S. tons).

## Processes of Soil Formation

The soil-forming factors, and subsequent processes of soil formation, result in the development of different layers, or soil horizons. The soil profile extends from the surface down to the parent material. Most soils contain three major horizons: the A, B,





**Figure 57.—Ped from the subsoil of a Voyageurs soil showing rust-orange-colored, redoximorphic, iron-rich concentrations.**

and C horizons. Soil forms through genetic processes that can be grouped into four general categories: additions, removals, transfers, and transformations.

On much of the upland landscape in Voyageurs National Park, the leaf and needle litter from the annual growth of vegetation accumulates on the forest floor and the partially decomposed organic detritus builds up into thin O horizons (fig. 56). Under anaerobic conditions in bogs and fens, the accumulation of organic deposits is much greater. The accumulation of organic matter in the A horizon of mineral soils is an example of an addition. This enrichment gives the A horizon its dark color.

The leaching of calcium carbonate from the upper 2 to 6 feet of many of the lacustrine soils in the park is an example of a removal. The sediments from Glacial Lake Agassiz contained calcium carbonate, but the lime has been leached from the upper part of the soil profile by percolating water.

The translocation of clay from the A and E horizons, which occurs in many soils in the survey area, is an example of a transfer. The E horizon is a zone of eluviation, or loss. Clay particles are transported downward in the soil profile by percolating water and redeposited in the B horizon as clay films on ped faces, as linings along pores and root channels, and as coatings on rock fragments. The B horizon is a zone of illuviation, or gain. Little Swan and Voyageurs soils are examples of soils in which the B horizon has more clay than the parent material and the A and E horizons have less clay due to translocation.

An example of a transformation is the reduction and solubilization of ferrous iron. This process takes place under wet, saturated conditions in which there is no molecular oxygen. Gleying, or the reduction of iron, is evident in Hassman, Sax, and other soils that have a dominantly gray subsoil. The gray color indicates the presence and removal of reduced ferrous iron, which, in turn, implies wetness. Reduced iron is soluble and can be leached and carried away in ground-water movement in the poorly and very poorly drained soils in the park. The ferrous iron can be oxidized into nonsoluble ferric iron and segregated in the form of concretions, or bright orange and red concentrations (fig. 57).





**Figure 58.—Profile of the Arcadian series in Voyageurs National Park. A dark reddish spodic horizon forms below a light-ash-colored eluvial horizon.**

Spodic horizons form in humid, cold climates in soils that have acidic parent material with a low clay content and that are subject to leaching (Soil Survey Staff, 1999). A spodic horizon is an illuvial layer with an accumulation of amorphous materials composed of organic matter and aluminum or iron oxides (Soil Survey Staff, 2014). Soils with spodic horizons form under forest vegetation dominated by coniferous species with needles that are low in cations, like calcium, and that increase the acidity of the soil (Brady and Weil, 2000). Organic matter becomes soluble under conditions of low pH and can bind to iron and aluminum, which can be leached lower in the soil profile. Through this process, the overlying eluvial horizon develops a light-ash color and the spodic horizon develops a darker reddish or brown color due to the added organic matter and iron oxides (fig. 58). Conditions necessary for formation of spodic horizons are marginal in Voyageurs National Park, so the occurrence of soils with spodic horizons is patchy. Arcadian, Metonga, and Dishno soils have an accumulation of spodic material in the subsoil.

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# Glossary

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- Ablation till.** Loose, permeable till deposited during the final downwasting of glacial ice. Lenses of crudely sorted sand and gravel are common.
- Aeration, soil.** The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.
- Aggregate, soil.** Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.
- Alluvium.** Material, such as sand, silt, or clay, deposited on land by streams.
- Alpha,alpha-dipyridyl.** A dye that when dissolved in 1N ammonium acetate is used to detect the presence of reduced iron (Fe II) in the soil. A positive reaction indicates a type of redoximorphic feature.
- Animal unit month (AUM).** The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.
- Aquic conditions.** Current soil wetness characterized by saturation, reduction, and redoximorphic features.
- Argillic horizon.** A subsoil horizon characterized by an accumulation of illuvial clay.
- Aspect.** The direction in which a slope faces.
- Association, soil.** A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.
- Available water capacity (available moisture capacity).** The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:
- |                |              |
|----------------|--------------|
| Very low ..... | 0 to 3       |
| Low .....      | 3 to 6       |
| Moderate.....  | 6 to 9       |
| High .....     | 9 to 12      |
| Very high..... | more than 12 |
- Backslope.** The position that forms the steepest and generally linear, middle portion of a hillslope. In profile, backslopes are commonly bounded by a convex shoulder above and a concave footslope below.
- Basal till.** Compact glacial till deposited beneath the ice.
- Base saturation.** The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.
- Base slope.** A geomorphic component of hills consisting of the concave to linear (perpendicular to the contour) slope that, regardless of the lateral shape, forms an apron or wedge at the bottom of a hillside dominated by colluvium and slope-wash sediments (for example, slope alluvium).
- Beach deposits.** Material, such as sand and gravel, that is generally laid down parallel to an active or relict shoreline of a postglacial or glacial lake.

- Beach ridge.** A low, essentially continuous mound of beach or beach-and-dune material heaped up by the action of waves and currents on the backshore of a beach, beyond the present limit of storm waves or the reach of ordinary tides, and occurring singly or as one of a series of approximately parallel deposits. The ridges are roughly parallel to the shoreline and represent successive positions of an advancing shoreline.
- Bedding planes.** Fine strata, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediment.
- Bedrock.** The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.
- Bedrock-controlled topography.** A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.
- Bench terrace.** A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.
- Bisequum.** Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.
- Bog.** Waterlogged, spongy ground consisting primarily of mosses and containing acidic, decaying vegetation, such as sphagnum, sedges, and heaths, which develops into peat. Bogs are fed by rainfall and have low nutrient status and low pH.
- Brush management.** Use of mechanical, chemical, or biological methods to make conditions favorable for reseeding or to reduce or eliminate competition from woody vegetation and thus allow understory grasses and forbs to recover. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.
- Calcareous soil.** A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.
- Canopy.** The leafy crown of trees or shrubs. (See Crown.)
- Capillary water.** Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.
- Catena.** A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.
- Cation.** An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.
- Cation-exchange capacity.** The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.
- Channery soil material.** Soil material that has, by volume, 15 to 35 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches (15 centimeters) along the longest axis. A single piece is called a chanter.
- Chemical treatment.** Control of unwanted vegetation through the use of chemicals.
- Clay.** As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.
- Clay depletions.** Low-chroma zones having a low content of iron, manganese, and clay because of the chemical reduction of iron and manganese and the removal of iron, manganese, and clay. A type of redoximorphic depletion.
- Clay film.** A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

- Claypan.** A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.
- Climax plant community.** The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.
- Coarse textured soil.** Sand or loamy sand.
- Cobble (or cobblestone).** A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.
- Cobbly soil material.** Material that has 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.
- COLE (coefficient of linear extensibility).** See Linear extensibility.
- Colluvium.** Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.
- Complex slope.** Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.
- Complex, soil.** A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.
- Consistence, soil.** Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the "Soil Survey Manual."
- Control section.** The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.
- Coprogenous earth (sedimentary peat).** Fecal material deposited in water by aquatic organisms.
- Corrosion.** Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.
- Crown.** The upper part of a tree or shrub, including the living branches and their foliage.
- Delta.** A body of alluvium having a surface that is nearly flat and fan shaped; deposited at or near the mouth of a river or stream where it enters a body of relatively quiet water, generally a sea or lake.
- Depression.** Any relatively sunken part of the earth's surface; especially a low-lying area surrounded by higher ground. A closed depression has no natural outlet for surface drainage. An open depression has a natural outlet for surface drainage.
- Depth, soil.** Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.
- Drainage class (natural).** Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—*excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat*



*poorly drained, poorly drained, and very poorly drained.* These classes are defined in the “Soil Survey Manual.”

- Drainageway.** Relatively small, linear depressions that, at some time, move concentrated water and either do not have a defined channel or have only a small defined channel.
- Drumlin.** A low, smooth, elongated oval hill, mound, or ridge of compact glacial till. The longer axis is parallel to the path of the glacier and commonly has a blunt nose pointing in the direction from which the ice approached.
- Duff.** A generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.
- Eluviation.** The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.
- Endosaturation.** A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.
- Eolian soil material.** Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.
- Ephemeral stream.** A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.
- Episaturation.** A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.
- Erosion.** The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.  
*Erosion* (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.  
*Erosion* (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.
- Erosion pavement.** A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.
- Escarpment.** A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Synonym: scarp.
- Esker.** A narrow, winding ridge of stratified gravelly and sandy drift deposited by a stream flowing in a tunnel beneath a glacier.
- Excess fines** (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.
- Excess salt** (in tables). Excess water-soluble salts in the soil restrict the growth of most plants.
- Fan terrace.** A relict alluvial fan, no longer a site of active deposition, incised by younger and lower alluvial surfaces.
- Fast intake** (in tables). The rapid movement of water into the soil.
- Fen.** A type of peatland that is mineraltrophic, being fed by mineral-rich surface water or ground water.
- Fertility, soil.** The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.
- Fibric soil material (peat).** The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according

to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

**Field moisture capacity.** The moisture content of a soil, expressed as a percentage of the oven-dry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity*, *normal moisture capacity*, or *capillary capacity*.

**Fine textured soil.** Sandy clay, silty clay, or clay.

**Firebreak.** An area cleared of flammable material to stop or help control creeping or running fires. It also serves as a line from which to work and to facilitate the movement of firefighters and equipment. Designated roads also serve as firebreaks.

**First bottom.** The normal flood plain of a stream, subject to frequent or occasional flooding.

**Flaggy soil material.** Material that has, by volume, 15 to 35 percent flagstones. Very flaggy soil material has 35 to 60 percent flagstones, and extremely flaggy soil material has more than 60 percent flagstones.

**Flagstone.** A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

**Flood plain.** A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

**Fluvial.** Of or pertaining to rivers; produced by river action, as a fluvial plain.

**Footslope.** The position that forms the inner, gently inclined surface at the base of a hillslope. In profile, footslopes are commonly concave. A footslope is a transition zone between upslope sites of erosion and transport (shoulders and backslopes) and downslope sites of deposition (toeslopes).

**Forb.** Any herbaceous plant not a grass or a sedge.

**Forest cover.** All trees and other woody plants (underbrush) covering the ground in a forest.

**Forest type.** A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

**Fragipan.** A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

**Frost action** (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

**Genesis, soil.** The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

**Geomorphology.** The science that treats the general configuration of the earth's surface; specifically the study of the classification, description, nature, origin, and development of landforms and their relationships to underlying structures, and the history of geologic changes as recorded by these surface features. The term is especially applied to the genetic interpretation of landforms.

**Glacial drift.** Pulverized and other rock material transported by glacial ice and then deposited. Also, the sorted and unsorted material deposited by streams flowing from glaciers.

**Glacial outwash.** Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

**Glacial till.** Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

- Glaciofluvial deposits.** Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.
- Glaciolacustrine deposits.** Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are interbedded or laminated.
- Gleyed soil.** Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.
- Gravel.** Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.
- Gravelly soil material.** Material that has 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.
- Ground water.** Water filling all the unblocked pores of the material below the water table.
- Gully.** A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.
- Hard bedrock.** Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.
- Hardpan.** A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.
- Head slope.** A geomorphic component of hills consisting of a laterally concave area of a hillside, especially at the head of a drainageway. The overland waterflow is converging.
- Hemic soil material (mucky peat).** Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.
- Herbaceous peat.** An accumulation of organic material, decomposed to some degree, which is predominantly the remains of sedges, reeds, cattails, and other herbaceous plants.
- High-chroma zones.** Zones having chroma of 3 or more; typical in areas of iron concentrations.
- Hill.** A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes of more than 15 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.
- Horizon, soil.** A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the "Soil Survey Manual." The major horizons of mineral soil are as follows:
- O horizon.*—An organic layer of fresh and decaying plant residue.
- A horizon.*—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.
- E horizon.*—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.
- B horizon.*—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon

also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

*C horizon*.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

*Cr horizon*.—Soft, consolidated bedrock beneath the soil.

*R layer*.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

**Humus.** The well decomposed, more or less stable part of the organic matter in mineral soils.

**Hydrologic soil groups.** Refers to soils grouped according to their runoff potential.

The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties are depth to a seasonal high water table, the infiltration rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

**Ice-walled lake plain.** A relict surface marking the floor of an extinct lake basin that was formed on solid ground and surrounded by stagnant ice in a stable or unstable superglacial environment on stagnation moraines. As the ice melted, the lake plain became perched above the adjacent landscape. The lake plain is well sorted, generally fine textured, stratified deposits.

**Igneous rock.** Rock formed by solidification from a molten or partially molten state. Major varieties include plutonic and volcanic rock. Examples are andesite, basalt, and granite.

**Illuviation.** The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

**Impervious soil.** A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

**Infiltration.** The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

**Infiltration capacity.** The maximum rate at which water can infiltrate into a soil under a given set of conditions.

**Infiltration rate.** The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

**Interfluv.** An elevated area between two drainageways that sheds water to those drainageways.

**Intermittent stream.** A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

**Iron concentrations.** High-chroma zones having a high content of iron and manganese oxide because of chemical oxidation and accumulation, but having a clay content similar to that of the adjacent matrix. A type of redoximorphic concentration.

**Iron depletions.** Low-chroma zones having a low content of iron and manganese oxide because of chemical reduction and removal, but having a clay content similar to that of the adjacent matrix. A type of redoximorphic depletion.



- Kame.** An irregular, short ridge or hill of stratified glacial drift.
- Kame moraine.** An end moraine that contains numerous kames. A group of kames along the front of a stagnant glacier, commonly comprising the slumped remnants of a formerly continuous outwash plain built up over the foot of rapidly wasting or stagnant ice.
- Karst** (topography). The relief of an area underlain by limestone that dissolves in differing degrees, thus forming numerous depressions or small basins.
- Knoll.** A small, low, rounded hill rising above adjacent landforms.
- $K_{sat}$ .** Saturated hydraulic conductivity. (See Permeability.)
- Lacustrine deposit.** Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.
- Lake bed.** The bottom of a lake; a lake basin.
- Lake plain.** A nearly level surface marking the floor of an extinct lake filled by well sorted, generally fine textured, stratified deposits, commonly containing varves.
- Lake terrace.** A narrow shelf, partly cut and partly built, produced along a lakeshore in front of a scarp line of low cliffs and later exposed when the water level falls.
- Lakeshore.** A narrow strip of land in contact with or bordering a lake; especially the beach of a lake.
- Lamella.** A thin (commonly less than 1 centimeter thick), discontinuous or continuous, generally horizontal layer of fine material (especially clay and iron oxides) that has been pedogenically concentrated (illuviated) within a coarser textured eluviated layer several centimeters to several decimeters thick.
- Landslide.** The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.
- Large stones** (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.
- Leaching.** The removal of soluble material from soil or other material by percolating water.
- Linear extensibility.** Refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. Linear extensibility is used to determine the shrink-swell potential of soils. It is an expression of the volume change between the water content of the clod at  $1/3$ - or  $1/10$ -bar tension (33kPa or 10kPa tension) and oven dryness. Volume change is influenced by the amount and type of clay minerals in the soil. The volume change is the percent change for the whole soil. If it is expressed as a fraction, the resulting value is COLE, coefficient of linear extensibility.
- Liquid limit.** The moisture content at which the soil passes from a plastic to a liquid state.
- Loam.** Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.
- Loess.** Fine grained material, dominantly of silt-sized particles, deposited by wind.
- Low-chroma zones.** Zones having chroma of 2 or less; typical in areas of iron depletions.
- Low-residue crops.** Such crops as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.
- Low strength.** The soil is not strong enough to support loads.
- Marl.** An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal amounts.
- Masses.** Concentrations of substances in the soil matrix that do not have a clearly defined boundary with the surrounding soil material and cannot be removed as a discrete unit. Common compounds making up masses are calcium carbonate, gypsum or other soluble salts, iron oxide, and manganese oxide. Masses

consisting of iron oxide or manganese oxide generally are considered a type of redoximorphic concentration.

**Mechanical treatment.** Use of mechanical equipment for seeding, brush management, and other management practices.

**Medium textured soil.** Very fine sandy loam, loam, silt loam, or silt.

**Metamorphic rock.** Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

**Mineral soil.** Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

**Minimum tillage.** Only the tillage essential to crop production and prevention of soil damage.

**Miscellaneous area.** An area that has little or no natural soil and supports little or no vegetation.

**Moderately coarse textured soil.** Coarse sandy loam, sandy loam, or fine sandy loam.

**Moderately fine textured soil.** Clay loam, sandy clay loam, or silty clay loam.

**Mollic epipedon.** A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

**Moraine.** An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

**Morphology, soil.** The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

**Mottling, soil.** Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: abundance—*few*, *common*, and *many*; size—*fine*, *medium*, and *coarse*; and contrast—*faint*, *distinct*, and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

**Muck.** Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

**Mucky peat.** Unconsolidated soil material consisting primarily of organic matter that is in an intermediate stage of decomposition such that a significant part of the material can be recognized.

**Mudstone.** Sedimentary rock formed by induration of silt and clay in approximately equal amounts.

**Munsell notation.** A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

**Neutral soil.** A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

**Nodules.** Cemented bodies lacking visible internal structure. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up nodules. If formed in place, nodules of iron oxide or manganese oxide are considered types of redoximorphic concentrations.

**Nose slope.** A geomorphic component of hills consisting of the projecting end (laterally convex area) of a hillside. The overland waterflow is predominantly divergent.

**Nutrient, plant.** Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

**Organic matter.** Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low .....	less than 0.5 percent
Low .....	0.5 to 1.0 percent
Moderately low.....	1.0 to 2.0 percent
Moderate.....	2.0 to 4.0 percent
High .....	4.0 to 8.0 percent
Very high.....	more than 8.0 percent

**Outwash plain.** A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it generally is low in relief.

**Paleoterrace.** An erosional remnant of a terrace that retains the surface form and alluvial deposits of its origin but was not emplaced by, and commonly does not grade to, a present-day stream or drainage network.

**Pan.** A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan*, *fragipan*, *claypan*, *plowpan*, and *traffic pan*.

**Parent material.** The unconsolidated organic and mineral material in which soil forms.

**Peat.** Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

**Peatland.** A general term for all classes of terrain covered by organic material (e.g., bogs and fens).

**Ped.** An individual natural soil aggregate, such as a granule, a prism, or a block.

**Pedisediment.** A thin layer of alluvial material that mantles an erosion surface and has been transported to its present position from higher-lying areas of the erosion surface.

**Pedon.** The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

**Percolation.** The movement of water through the soil.

**Percs slowly** (n tables). The slow movement of water through the soil adversely affects the specified use.

**Permeability.** The quality of the soil that enables water or air to move downward through the profile. The rate at which a saturated soil transmits water is accepted as a measure of this quality. In soil physics, the rate is referred to as "saturated hydraulic conductivity," which is defined in the "Soil Survey Manual." In line with conventional usage in the engineering profession and with traditional usage in published soil surveys, this rate of flow continues to be expressed as "permeability." Terms describing permeability, measured in inches per hour, are as follows:

Extremely slow.....	0.0 to 0.01 inch
Very slow .....	0.01 to 0.06 inch
Slow .....	0.06 to 0.2 inch
Moderately slow.....	0.2 to 0.6 inch
Moderate.....	0.6 inch to 2.0 inches
Moderately rapid.....	2.0 to 6.0 inches
Rapid .....	6.0 to 20 inches
Very rapid.....	more than 20 inches

**Phase, soil.** A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

**pH value.** A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

**Piping** (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

- Pitted outwash plain.** An outwash plain marked by many irregular depressions, such as kettles, shallow pits, and potholes, that formed by melting of incorporated ice masses. Many examples can be observed in Wisconsin and Minnesota.
- Plasticity index.** The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.
- Plastic limit.** The moisture content at which a soil changes from semisolid to plastic.
- Ponding.** Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.
- Poor filter** (in tables). Because of rapid or very rapid permeability, the soil may not adequately filter effluent from a waste disposal system.
- Poorly graded.** Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.
- Potential native plant community.** See Climax plant community.
- Potential rooting depth (effective rooting depth).** Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.
- Prescribed burning.** Deliberately burning an area for specific management purposes, under the appropriate conditions of weather and soil moisture and at the proper time of day.
- Productivity, soil.** The capability of a soil for producing a specified plant or sequence of plants under specific management.
- Profile, soil.** A vertical section of the soil extending through all its horizons and into the parent material.
- Raised bog.** An area where the accretion of peat, over time, eventually formed a shallow dome a few meters higher in the center than the surrounding peatland. This peatland builds up above the local ground-water source and becomes wholly rainfed, developing acidic conditions.
- Reaction, soil.** A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid.....	less than 3.5
Extremely acid .....	3.5 to 4.4
Very strongly acid .....	4.5 to 5.0
Strongly acid.....	5.1 to 5.5
Moderately acid .....	5.6 to 6.0
Slightly acid.....	6.1 to 6.5
Neutral .....	6.6 to 7.3
Slightly alkaline.....	7.4 to 7.8
Moderately alkaline.....	7.9 to 8.4
Strongly alkaline .....	8.5 to 9.0
Very strongly alkaline.....	9.1 and higher

- Red beds.** Sedimentary strata that are mainly red and are made up largely of sandstone and shale.
- Redoximorphic concentrations.** Nodules, concretions, soft masses, pore linings, and other features resulting from the accumulation of iron or manganese oxide. An indication of chemical reduction and oxidation resulting from saturation.
- Redoximorphic depletions.** Low-chroma zones from which iron and manganese oxide or a combination of iron and manganese oxide and clay has been removed. These zones are indications of the chemical reduction of iron resulting from saturation.
- Redoximorphic features.** Redoximorphic concentrations, redoximorphic depletions, reduced matrices, a positive reaction to alpha,alpha-dipyridyl, and other



features indicating the chemical reduction and oxidation of iron and manganese compounds resulting from saturation.

**Reduced matrix.** A soil matrix that has low chroma *in situ* because of chemically reduced iron (Fe II). The chemical reduction results from nearly continuous wetness. The matrix undergoes a change in hue or chroma within 30 minutes after exposure to air as the iron is oxidized (Fe III). A type of redoximorphic feature.

**Regolith.** The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

**Relief.** The elevations or inequalities of a land surface, considered collectively.

**Residuum (residual soil material).** Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

**Rill.** A steep-sided channel resulting from accelerated erosion. A rill generally is a few inches deep and not wide enough to be an obstacle to farm machinery.

**Rise.** A slight increase in elevation of the land surface, typically with a broad summit and gently sloping sides.

**Rock fragments.** Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

**Root zone.** The part of the soil that can be penetrated by plant roots.

**Rooting depth** (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

**Runoff.** The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

**Saline soil.** A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

**Sand.** As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

**Sandstone.** Sedimentary rock containing dominantly sand-sized particles.

**Sapric soil material (muck).** The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

**Saprolite.** Unconsolidated residual material underlying the soil and grading to hard bedrock below.

**Saturation.** Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

**Scarification.** The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

**Second bottom.** The first terrace above the normal flood plain (or first bottom) of a river.

**Sedimentary rock.** Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

**Seepage** (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

**Sequum.** A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

- Series, soil.** A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.
- Shale.** Sedimentary rock formed by the hardening of a clay deposit.
- Sheet erosion.** The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.
- Shoulder.** The position that forms the uppermost inclined surface near the top of a hillslope. It is a transition from backslope to summit. The surface is dominantly convex in profile and erosional in origin.
- Shrink-swell** (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.
- Side slope.** A geomorphic component of hills consisting of a laterally planar area of a hillside. The overland waterflow is predominantly parallel.
- Silica.** A combination of silicon and oxygen. The mineral form is called quartz.
- Silt.** As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.
- Siltstone.** Sedimentary rock made up of dominantly silt-sized particles.
- Similar soils.** Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.
- Sinkhole.** A depression in the landscape where limestone has been dissolved.
- Site index.** A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.
- Slope.** The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.
- Slope** (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.
- Sloughed till.** Water-saturated till that has flowed slowly downhill from its original place of deposit by glacial ice. It may rest on other till, on glacial outwash, or on a glaciolacustrine deposit.
- Slow intake** (in tables). The slow movement of water into the soil.
- Slow refill** (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.
- Small stones** (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.
- Sodium adsorption ratio (SAR).** A measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration.
- Soft bedrock.** Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.
- Soil.** A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.
- Soil separates.** Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

## Soil Survey of Voyageurs National Park, Minnesota

Very coarse sand .....	2.0 to 1.0
Coarse sand .....	1.0 to 0.5
Medium sand .....	0.5 to 0.25
Fine sand .....	0.25 to 0.10
Very fine sand .....	0.10 to 0.05
Silt .....	0.05 to 0.002
Clay .....	less than 0.002

**Solum.** The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

**Spodic horizon.** A dark reddish brown or reddish brown soil layer with fine sandy loam or coarser texture. This layer is a result of illuviated organic matter and aluminum, with or without iron.

**Stagnation moraine.** A body of drift released by the melting of a glacier that ceased flowing. It commonly (but not always) occurs near ice margins and is composed of till, ice-contact stratified drift, and small areas of glacial lake sediment. Typical landforms are knob-and-kettle topography, which locally include ice-walled lake plains.

**Stone line.** A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

**Stones.** Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

**Stony.** Refers to a soil containing stones in numbers that interfere with or prevent tillage.

**Structure, soil.** The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

**Subsidence.** The potential decrease in surface elevation as a result of the drainage of wet soils that have organic layers or semifluid mineral layers. Subsidence, as a result of drainage, is attributed to (1) shrinkage from drying, (2) consolidation due to the loss of ground-water buoyancy, (3) compaction from tillage or manipulation, (4) wind erosion, (5) burning, and (6) biochemical oxidation.

**Subsoil.** Technically, the B horizon; roughly, the part of the solum below plow depth.

**Substratum.** The part of the soil below the solum.

**Subsurface layer.** Any surface soil horizon (A, E, AB, or EB) below the surface layer.

**Summit.** The topographically highest position of a hillslope. It has a nearly level (planar or only slightly convex) surface.

**Surface layer.** The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the “plow layer,” or the “Ap horizon.”

**Surface soil.** The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

**Swale.** A slight depression in the midst of generally level land. A shallow depression in an undulating ground moraine caused by uneven glacial deposition.

**Taxadjuncts.** Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to

be of consequence in interpreting their use and behavior. Soils are recognized as taxadjuncts only when one or more of their characteristics are slightly outside the range defined for the family of the series for which the soils are named.

**Terminal moraine.** A belt of thick glacial drift that generally marks the termination of important glacial advances.

**Terrace.** An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

**Terrace** (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

**Texture, soil.** The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay*, and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

**Thin layer** (in tables). Otherwise suitable soil material that is too thin for the specified use.

**Till.** Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

**Till plain.** An extensive area of nearly level to undulating soils underlain by glacial till.

**Tilth, soil.** The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

**Toeslope.** The position that forms the gently inclined surface at the base of a hillslope. Toeslopes in profile are commonly gentle and linear and are constructional surfaces forming the lower part of a hillslope continuum that grades to valley or closed-depression floors.

**Topsoil.** The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

**Trace elements.** Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

**Upland.** Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

**Valley fill.** In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

**Variegation.** Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

**Varve.** A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

**Water bars.** Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

**Weathering.** All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

**Well graded.** Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.



**Wilting point (or permanent wilting point).** The moisture content of soil, on an oven-dry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

**Windthrow.** The uprooting and tipping over of trees by the wind.

**Woody peat.** An accumulation of organic material that is predominantly composed of trees, shrubs, and other woody plants.

## Tables

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# Soil Survey of Voyageurs National Park, Minnesota

Table 1.—Temperature and Precipitation

(Recorded in the period 1981-2010 at International Falls, Minnesota)

Month	Temperature (degrees F)						Precipitation (inches)				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have--		Average number of growing degree days*	Average	2 years in 10 will have--		Average number of days with 0.10 inch or more	Average snow- fall
				Maximum temp. higher than--	Minimum temp. lower than--			Less than--	More than--		
January--	15.4	-6.6	4.4	43	-40	0	0.62	0.29	0.92	2	15.0
February--	22.0	-1.3	10.4	48	-36	0	0.57	0.21	0.84	2	10.8
March----	34.7	12.5	23.6	61	-23	10	0.95	0.39	1.41	3	7.6
April----	51.5	27.1	39.3	81	5	114	1.53	0.74	2.21	4	6.4
May-----	64.8	38.7	51.8	88	22	396	2.86	1.58	3.98	7	0.2
June-----	73.2	48.4	60.8	91	31	643	3.92	2.49	5.21	8	0.0
July-----	77.8	52.6	65.2	93	38	802	3.70	2.23	5.01	7	0.0
August---	75.9	50.7	63.3	92	35	744	2.81	1.54	3.93	6	0.0
September	65.4	41.8	53.6	87	25	432	2.99	1.54	4.24	6	0.1
October--	51.1	31.0	41.1	78	13	136	2.08	0.96	3.03	5	2.2
November--	33.7	17.4	25.6	61	-12	15	1.38	0.72	1.94	4	13.7
December--	19.0	0.4	9.7	43	-34	0	0.81	0.35	1.19	3	15.0
Yearly: Average	48.7	26.1	37.4	---	---	---	---	---	---	---	---
Extreme	99	-45	---	95	-41	---	---	---	---	---	---
Total	---	---	---	---	---	3,292	24.22	20.94	27.28	55	71.0

\* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40 degrees F).

# Soil Survey of Voyageurs National Park, Minnesota

Table 2.—Freeze Dates in Spring and Fall

(Recorded in the period 1981-2010 at International Falls, Minnesota)

Probability	Temperature (degrees F)		
	24 or lower	28 or lower	32 or lower
Last freezing temperature in spring:			
1 year in 10 later than--	May 12	May 25	June 10
2 years in 10 later than--	May 8	May 20	June 5
5 years in 10 later than--	Apr. 30	May 10	May 26
First freezing temperature in fall:			
1 year in 10 earlier than--	Sept. 25	Sept. 15	Sept. 2
2 years in 10 earlier than--	Sept. 30	Sept. 18	Sept. 6
5 years in 10 earlier than--	Oct. 8	Sept. 25	Sept. 15

Table 3.—Growing Season

(Recorded in the period 1981-2010 at International Falls, Minnesota)

Probability	Daily minimum temperature (degrees F) during growing season		
	Higher than 24	Higher than 28	Higher than 32
	<u>Days</u>	<u>Days</u>	<u>Days</u>
9 years in 10	145	119	88
8 years in 10	150	125	96
5 years in 10	161	138	112
2 years in 10	172	150	127
1 year in 10	178	156	135



# Soil Survey of Voyageurs National Park, Minnesota

Table 4.—Soil Legend

Map unit symbol and map unit name	Components in map unit	Percent of map unit
2srmd: Quetico-Insula, bouldery-Rock outcrop complex, 3 to 18 percent slopes, LRU 93C-----	Quetico, bouldery	35
	Insula, bouldery	20
	Rock outcrop	15
	Wahlsten, bouldery, skeletal	10
	Conic, bouldery, skeletal	10
	Arcadian, very stony	10
2srqm: Quetico-Insula, bouldery-Rock outcrop complex, 8 to 60 percent slopes-----	Quetico, bouldery	40
	Insula, bouldery	25
	Rock outcrop	15
	Conic, bouldery, skeletal	10
	Arcadian, very stony	10
2srqn: Insula-Conic-Rock outcrop complex, 8 to 25 percent slopes, very bouldery-----	Insula, very bouldery, skeletal	35
	Conic, very bouldery, skeletal	16
	Rock outcrop	15
	Metonga, very stony, skeletal	14
	Quetico, very bouldery, skeletal	10
	Wahlsten, very stony	5
	Voyageurs	3
	Aquepts, very rubbly	2

# Soil Survey of Voyageurs National Park, Minnesota

Table 4.—Soil Legend—Continued

Map unit symbol and map unit name	Components in map unit	Percent of map unit
2srqp: Quetico-Insula, very bouldery-Greenwood complex, 0 to 12 percent slopes, very rocky-----	Quetico, very bouldery, skeletal	31
	Insula, very bouldery, skeletal	30
	Greenwood	15
	Rock outcrop	9
	Merwin	5
	Aquepts, very rubbly	5
	Wahlsten, very stony	3
	Conic, very bouldery, skeletal	2
2srqr: Greenwood peat, 0 to 1 percent slopes-----	Greenwood	80
	Merwin	10
	Rifle, moat	5
	Tacoosh, moat	5

# Soil Survey of Voyageurs National Park, Minnesota

Table 4.—Soil Legend—Continued

Map unit symbol and map unit name	Components in map unit	Percent of map unit
2srqs: Insula-Conic-Wahlsten complex, 0 to 12 percent slopes, very stony, very rocky-----	Insula, very stony, skeletal	30
	Conic, very stony, skeletal	16
	Wahlsten, very stony	15
	Quetico, very stony, skeletal	10
	Metonga, very stony, skeletal	9
	Dishno, very stony, skeletal	9
	Aquepts, very rubbly	3
	Aquepts, stony, moderately slow Ksat	2
	Voyageurs	2
	Rock outcrop	2
	Foglake	1
	Eaglesnest, very stony	1
2srqv: Voyageurs, oxyaquic-Conic, very stony-Littleswan complex, 0 to 12 percent slopes, rocky-----	Voyageurs, oxyaquic	35
	Conic, very stony, skeletal	15
	Littleswan	20
	Insula, very stony, skeletal	10
	Wahlsten, very stony	5
	Metonga, very stony, skeletal	5
	Baudette	5
	Aquepts, stony, moderately slow Ksat	4
	Rock outcrop	1

# Soil Survey of Voyageurs National Park, Minnesota

Table 4.—Soil Legend—Continued

Map unit symbol and map unit name	Components in map unit	Percent of map unit
2srqw: Wahlsten, very stony-Spooner-Voyageurs complex, 0 to 8 percent slopes, rocky-----	Wahlsten, very stony	26
	Spooner	24
	Voyageurs	22
	Insula, very stony, skeletal	10
	Dishno, very stony, skeletal	9
	Aquepts, stony, moderately slow Ksat	3
	Littleswan	3
	Aquepts, very rubbly	2
	Rock outcrop	1
2srqy: Baudette-Littleswan complex, 0 to 8 percent slopes-----	Baudette	40
	Littleswan	35
	Voyageurs	10
	Wahlsten, very stony	5
	Insula, very stony, skeletal	5
	Spooner	5
2srqz: Canthook-Durkeelake complex, 0 to 12 percent slopes----	Canthook	30
	Durkeelake	30
	Bootleg	10
	Udipsamments	10
	Grytal	10
	Voyageurs	5
	Aquepts, stony, moderately slow Ksat	5



# Soil Survey of Voyageurs National Park, Minnesota

Table 4.—Soil Legend—Continued

Map unit symbol and map unit name	Components in map unit	Percent of map unit
2srr3: Spooner-Sax complex, 0 to 2 percent slopes-----	Spooner	40
	Sax	35
	Spooner, till/bedrock substratum	5
	Foglake	5
	Littleswan	5
	Bootleg	5
	Canthook	5
2srr4: Littleswan-Spooner complex, 0 to 3 percent slopes-----	Littleswan	40
	Spooner	25
	Voyageurs	10
	Spooner, till/bedrock substratum	5
	Sax	5
	Foglake	5
	Bootleg	5
	Canthook	5
2srr7: Mooselake mucky peat, 0 to 1 percent slopes-----	Mooselake	80
	Tacoosh, moat	10
	Rifle	5
	Cathro, moat	5
2srr8: Rifle mucky peat, 0 to 1 percent slopes-----	Rifle	80
	Tacoosh, moat	10
	Greenwood	5
	Aquepts, stony, moderately slow Ksat	5

# Soil Survey of Voyageurs National Park, Minnesota

Table 4.—Soil Legend—Continued

Map unit symbol and map unit name	Components in map unit	Percent of map unit
2srr9: Tacoosh and Sax soils, 0 to 1 percent slopes, frequently flooded-----	Tacoosh, frequently flooded	40
	Sax, frequently flooded	35
	Cathro, frequently flooded	10
	Rifle, frequently flooded	10
	Hassman, frequently flooded	5
2srrb: Aguents, Sax, and Tacoosh soils, 0 to 1 percent slopes, ponded-----	Aguents, ponded	30
	Sax, ponded	25
	Tacoosh, ponded	25
	Rifle, ponded	10
	Hassman, ponded	10
2srrh: Greenwood peat, 0 to 1 percent slopes, seasonally ponded-----	Greenwood, seasonally ponded	80
	Merwin, seasonally ponded	10
	Rifle, seasonally ponded	5
	Tacoosh, seasonally ponded	5

# Soil Survey of Voyageurs National Park, Minnesota

Table 4.—Soil Legend—Continued

Map unit symbol and map unit name	Components in map unit	Percent of map unit
2srrj: Rifle mucky peat, 0 to 1 percent slopes, seasonally ponded-----	Rifle, seasonally ponded	80
	Tacoosh, seasonally ponded	10
	Greenwood, seasonally ponded	5
	Aquepts, stony, moderately slow Ksat	5
2srrk: Insula-Conic-Wahlsten complex, 0 to 25 percent slopes, very stony, very rocky-----	Insula, very stony, skeletal	30
	Conic, very stony, skeletal	16
	Wahlsten, very stony	15
	Quetico, very stony, skeletal	10
	Metonga, very stony, skeletal	9
	Dishno, very stony, skeletal	9
	Aquepts, very rubbly	3
	Aquepts, stony, moderately slow Ksat	2
	Voyageurs	2
	Rock outcrop	2
	Foglake	1
	Eaglesnest, very stony	1

# Soil Survey of Voyageurs National Park, Minnesota

Table 4.—Soil Legend—Continued

Map unit symbol and map unit name	Components in map unit	Percent of map unit
2srrl: Tacoosh and Sax soils, 0 to 1 percent slopes, occasionally flooded-----	Tacoosh, occasionally flooded	40
	Sax, occasionally flooded	35
	Cathro, occasionally flooded	10
	Rifle, occasionally flooded	10
	Hassman, occasionally flooded	5
2srrm: Brickton-Hassman complex, 0 to 2 percent slopes-----	Brickton	40
	Hassman	35
	Spooner, till/bedrock substratum	5
	Foglake	5
	Dalbo	5
	Bootleg	5
	Tacoosh	5
2srrn: Brickton-Dalbo complex, 0 to 3 percent slopes-----	Brickton	60
	Dalbo	15
	Voyageurs	5
	Foglake	5
	Spooner, till/bedrock substratum	5
	Bootleg	5
	Hassman	5



# Soil Survey of Voyageurs National Park, Minnesota

Table 4.—Soil Legend—Continued

Map unit symbol and map unit name	Components in map unit	Percent of map unit
<b>2srrq:</b> Cathro and Tacoosh soils, 0 to 1 percent slopes, ponded	Cathro, ponded	60
	Tacoosh, ponded	30
	Sax, ponded	5
	Aquepts, stony, moderately slow Ksat	5
<b>2srrr:</b> Insula, very stony-Voyageurs-Wahlsten, very stony complex, 0 to 12 percent slopes, very rocky-----	Insula, very stony, skeletal	30
	Voyageurs	20
	Wahlsten, very stony	15
	Conic, very stony, skeletal	10
	Spooner, till/bedrock substratum	8
	Brickton	5
	Dishno, very stony, skeletal	5
	Aquepts, very rubbly	3
	Aquepts, stony, moderately slow Ksat	2
	Rock outcrop	2
<b>2srtr:</b> Bowstring and Fluvaquents soils, 0 to 2 percent slopes, frequently flooded-----	Bowstring, frequently flooded	50
	Fluvaquents, frequently flooded	40
	Cathro, frequently flooded	10
<b>W:</b> Water-----	Water	100

# Soil Survey of Voyageurs National Park, Minnesota

Table 5.--Acres, Hectares, and Proportionate Extent of the Map Units

Map symbol	Map unit name	Acres	Hectares	Percent
2srmd	Quetico-Insula, bouldery-Rock outcrop complex, 3 to 18 percent slopes, LRU 93C-----	12,094	4,894	5.5
2srqm	Quetico-Insula, bouldery-Rock outcrop complex, 8 to 60 percent slopes-----	10,338	4,184	4.7
2srqn	Insula-Conic-Rock outcrop complex, 8 to 25 percent slopes, very bouldery-----	22,276	9,015	10.2
2srqp	Quetico-Insula, very bouldery-Greenwood complex, 0 to 12 percent slopes, very rocky-----	834	338	0.4
2srqr	Greenwood peat, 0 to 1 percent slopes-----	6,475	2,620	3.0
2srqs	Insula-Conic-Wahlsten complex, 0 to 12 percent slopes, very stony, very rocky-----	16,134	6,529	7.4
2srqv	Voyageurs, oxyaquic-Conic, very stony-Littleswan complex, 0 to 12 percent slopes, rocky-----	4,424	1,790	2.0
2srqw	Wahlsten, very stony-Spooner-Voyageurs complex, 0 to 8 percent slopes, rocky-----	5,438	2,201	2.5
2srqy	Baudette-Littleswan complex, 0 to 8 percent slopes-----	290	117	0.1
2srqz	Canthook-Durkeelake complex, 0 to 12 percent slopes-----	1,188	481	0.5
2srr3	Spooner-Sax complex, 0 to 2 percent slopes-----	4,758	1,926	2.2
2srr4	Littleswan-Spooner complex, 0 to 3 percent slopes-----	4,248	1,719	1.9
2srr7	Mooselake mucky peat, 0 to 1 percent slopes-----	282	114	0.1
2srr8	Rifle mucky peat, 0 to 1 percent slopes-----	2,418	979	1.1
2srr9	Tacoosh and Sax soils, 0 to 1 percent slopes, frequently flooded-----	1,636	662	0.8
2srrb	Aquents, Sax, and Tacoosh soils, 0 to 1 percent slopes, ponded-----	7,542	3,052	3.5
2srrh	Greenwood peat, 0 to 1 percent slopes, seasonally ponded----	2,074	839	1.0
2srrj	Rifle mucky peat, 0 to 1 percent slopes, seasonally ponded---	3,826	1,548	1.8
2srrk	Insula-Conic-Wahlsten complex, 0 to 25 percent slopes, very stony, very rocky-----	23,925	9,682	11.0
2srrl	Tacoosh and Sax soils, 0 to 1 percent slopes, occasionally flooded-----	1,310	530	0.6
2srrm	Brickton-Hassman complex, 0 to 2 percent slopes-----	1,061	429	0.5
2srrn	Brickton-Dalbo complex, 0 to 3 percent slopes-----	1,311	531	0.6
2srrq	Cathro and Tacoosh soils, 0 to 1 percent slopes, ponded-----	1,784	722	0.8
2srrr	Insula, very stony-Voyageurs-Wahlsten, very stony complex, 0 to 12 percent slopes, very rocky-----	3,123	1,264	1.4
2srtr	Bowstring and Fluvuquents soils, 0 to 2 percent slopes, frequently flooded-----	744	301	0.3
W	Water-----	78,521	31,776	36.0
	Total-----	218,054	88,244	100.0

\* Less than 0.1 percent.

# Soil Survey of Voyageurs National Park, Minnesota

Table 6.—Climate, Landform, Landscape, and Parent Material

(MAP indicates mean annual precipitation)

Map unit symbol and soil name	Pct. of map unit	Slope	Elevation	MAP	Landform and/or landscape	Parent material
	<u>Pct</u>	<u>Pct</u>	<u>Meters</u>	<u>Cm</u>		
2srmd: Quetico, bouldery--	35	3-18	337-429	660-960	Moraine and upland	Coarse-loamy till over igneous bedrock
Insula, bouldery---	20	3-18	337-429	660-960	Moraine and upland	Coarse-loamy till over igneous bedrock
Rock outcrop-----	15	3-18	337-429	660-960	Hillslope and upland	None assigned
Wahlsten, bouldery, skeletal	10	1-8	337-429	660-960	Moraine and upland	Coarse-loamy till over igneous bedrock
Conic, bouldery, skeletal-----	10	3-18	337-429	660-960	Moraine and upland	Coarse-loamy till over igneous bedrock
Arcadian, very stony-----	10	3-35	337-429	660-960	Moraine and upland	Coarse-loamy till over igneous bedrock
2srqm: Quetico, bouldery--	40	8-35	337-429	660-960	Moraine and upland	Coarse-loamy till over igneous bedrock
Insula, bouldery---	25	8-35	337-429	660-960	Moraine and upland	Coarse-loamy till over igneous bedrock
Rock outcrop-----	15	8-60	337-429	660-960	Hillslope and upland	None assigned
Conic, bouldery, skeletal-----	10	3-18	337-429	660-960	Moraine and upland	Coarse-loamy till over igneous bedrock
Arcadian, very stony-----	10	3-35	337-429	660-960	Moraine and upland	Coarse-loamy till over igneous bedrock
2srqn: Insula, very bouldery, skeletal	35	8-25	337-429	660-960	Moraine and upland	Coarse-loamy till over igneous rock
Conic, very bouldery, skeletal	16	8-25	337-429	660-960	Moraine and upland	Coarse-loamy till over igneous rock

# Soil Survey of Voyageurs National Park, Minnesota

Table 6.—Climate, Landform, Landscape, and Parent Material—Continued

Map unit symbol and soil name	Pct. of map unit	Slope	Elevation	MAP	Landform and/or landscape	Parent material
	Pct	Pct	Meters	Cm		
2srqn: Rock outcrop-----	15	8-25	337-429	660-960	Hillslope and upland	None assigned
Metonga, very stony, skeletal---	14	0-12	337-429	660-960	Moraine and upland	Coarse-loamy till over igneous rock
Quetico, very bouldery, skeletal	10	8-25	337-429	660-960	Moraine and upland	Coarse-loamy till over igneous rock
Wahlsten, very stony-----	5	1-8	337-429	660-960	Moraine and upland	Coarse-loamy till over igneous rock
Voyageurs-----	3	0-3	337-429	660-960	Flat, lake plain, and upland	Silty glaciolacustrine deposits over water-worked till over igneous rock
Aquepts, very rubbly-----	2	0-2	337-429	660-960	Drainageway, moraine, and upland	Coarse-loamy till
2srqp: Quetico, very bouldery, skeletal	31	2-12	337-429	660-960	Moraine and upland	Coarse-loamy till over igneous rock
Insula, very bouldery, skeletal	30	2-12	337-429	660-960	Moraine and upland	Coarse-loamy till over igneous rock
Greenwood-----	15	0-1	337-429	660-960	Bog, lake plain, and upland	Mossy organic material over herbaceous organic material
Rock outcrop-----	9	0-12	337-429	660-960	Hillslope and upland	None assigned
Merwin-----	5	0-1	337-429	660-960	Bog, lake plain, and upland	Herbaceous organic material over loamy glaciolacustrine deposits
Aquepts, very rubbly-----	5	0-2	337-429	660-960	Drainageway, moraine, and upland	Coarse-loamy till
Wahlsten, very stony-----	3	1-8	337-429	660-960	Moraine and upland	Coarse-loamy till over igneous rock
Conic, very bouldery, skeletal	2	2-12	337-429	660-960	Moraine and upland	Coarse-loamy till over igneous rock

# Soil Survey of Voyageurs National Park, Minnesota

Table 6.—Climate, Landform, Landscape, and Parent Material—Continued

Map unit symbol and soil name	Pct. of map unit	Slope	Elevation	MAP	Landform and/or landscape	Parent material
	Pct	Pct	Meters	Cm		
2srqr: Greenwood-----	80	0-1	337-429	660-960	Bog, lake plain, and upland	Mossy organic material over herbaceous organic material
Merwin-----	10	0-1	337-429	660-960	Bog, lake plain, and upland	Herbaceous organic material over loamy glaciolacustrine deposits
Rifle, moat-----	5	0-1	337-429	660-960	Fen, lake plain, rim, and upland	Herbaceous organic material
Tacoosh, moat-----	5	0-1	337-429	660-960	Fen, lake plain, rim, and upland	Herbaceous organic material over silty glaciolacustrine deposits
2srqs: Insula, very stony, skeletal---	30	2-12	337-429	660-960	Moraine and upland	Coarse-loamy till over igneous rock
Conic, very stony, skeletal-----	16	2-12	337-429	660-960	Moraine and upland	Coarse-loamy till over igneous rock
Wahlsten, very stony-----	15	1-8	337-429	660-960	Moraine and upland	Coarse-loamy till over igneous rock
Quetico, very stony, skeletal---	10	2-12	337-429	660-960	Moraine and upland	Coarse-loamy till over igneous rock
Metonga, very stony, skeletal---	9	0-12	337-429	660-960	Moraine and upland	Coarse-loamy till over igneous rock
Dishno, very stony, skeletal---	9	0-8	337-429	660-960	Moraine and upland	Coarse-loamy till over igneous rock
Aquepts, very rubbly-----	3	0-2	337-429	660-960	Drainageway, moraine, and upland	Coarse-loamy till
Aquepts, stony, moderately slow Ksat-----	2	0-2	337-429	660-960	Depression, lake plain, and upland	Loamy glaciolacustrine deposits



# Soil Survey of Voyageurs National Park, Minnesota

Table 6.—Climate, Landform, Landscape, and Parent Material—Continued

Map unit symbol and soil name	Pct. of map unit	Slope	Elevation	MAP	Landform and/or landscape	Parent material
	Pct	Pct	Meters	Cm		
2srqs: Voyageurs-----	2	0-5	337-429	660-960	Flat, lake plain, and upland	Silty glaciolacustrine deposits over water-worked till over igneous rock
Rock outcrop-----	2	0-12	337-429	660-960	Hillslope and upland	None assigned
Foglake-----	1	0-2	337-429	660-960	Drainageway, flat, lake plain, and upland	Clayey glaciolacustrine deposits
Eaglesnest, very stony-----	1	0-12	337-429	660-960	Moraine and upland	Coarse-loamy till over dense till
2srqv: Voyageurs, oxyaquic	35	0-8	337-429	660-960	Lake plain, rise, and upland	Silty glaciolacustrine deposits over till over igneous rock
Conic, very stony, skeletal-----	15	2-12	337-429	660-960	Moraine and upland	Coarse-loamy till over igneous rock
Littleswan-----	20	0-4	337-429	660-960	Flat, lake plain, and upland	Silty glaciolacustrine deposits
Insula, very stony, skeletal---	10	2-12	337-429	660-960	Moraine and upland	Coarse-loamy till over igneous rock
Wahlsten, very stony-----	5	1-8	337-429	660-960	Moraine and upland	Coarse-loamy till over igneous rock
Metonga, very stony, skeletal---	5	0-12	337-429	660-960	Moraine and upland	Coarse-loamy till over igneous rock
Baudette-----	5	0-6	337-429	660-960	Lake plain, rise, and upland	Silty glaciolacustrine deposits
Aquepts, stony, moderately slow Ksat-----	4	0-2	337-429	660-960	Depression, lake plain, and upland	Loamy glaciolacustrine deposits
Rock outcrop-----	1	0-12	337-429	660-960	Hillslope and upland	None assigned

# Soil Survey of Voyageurs National Park, Minnesota

Table 6.—Climate, Landform, Landscape, and Parent Material—Continued

Map unit symbol and soil name	Pct. of map unit	Slope	Elevation	MAP	Landform and/or landscape	Parent material
	Pct	Pct	Meters	Cm		
2srqw: Wahlsten, very stony-----	26	1-8	337-429	660-960	Moraine and upland	Coarse-loamy till over igneous rock
Spooner-----	24	0-2	337-429	660-960	Drainageway, flat, lake plain, and upland	Silty glaciolacustrine deposits
Voyageurs-----	22	0-5	337-429	660-960	Flat, lake plain, and upland	Silty glaciolacustrine deposits over water-worked till over igneous rock
Insula, very stony, skeletal---	10	2-8	337-429	660-960	Moraine and upland	Coarse-loamy till over igneous rock
Dishno, very stony, skeletal---	9	0-8	337-429	660-960	Moraine and upland	Coarse-loamy till over igneous rock
Aquepts, stony, moderately slow Ksat-----	3	0-2	337-429	660-960	Depression, lake plain, and upland	Loamy glaciolacustrine deposits
Littleswan-----	3	0-4	337-429	660-960	Flat, lake plain, and upland	Silty glaciolacustrine deposits
Aquepts, very rubby-----	2	0-2	337-429	660-960	Drainageway, moraine, and upland	Coarse-loamy till
Rock outcrop-----	1	0-8	337-429	660-960	Hillslope and upland	None assigned
2srqy: Baudette-----	40	0-8	337-429	660-960	Flat, lake plain, rise, and upland	Silty glaciolacustrine deposits
Littleswan-----	35	0-4	337-429	660-960	Flat, lake plain, and upland	Silty glaciolacustrine deposits
Voyageurs-----	10	0-5	337-429	660-960	Flat, lake plain, and upland	Silty glaciolacustrine deposits over water-worked till over igneous rock
Wahlsten, very stony-----	5	1-8	337-429	660-960	Moraine and upland	Coarse-loamy till over igneous rock

# Soil Survey of Voyageurs National Park, Minnesota

Table 6.—Climate, Landform, Landscape, and Parent Material—Continued

Map unit symbol and soil name	Pct. of map unit	Slope	Elevation	MAP	Landform and/or landscape	Parent material
	Pct	Pct	Meters	Cm		
2srqy: Insula, very stony, skeletal---	5	2-8	337-429	660-960	Moraine and upland	Coarse-loamy till over igneous rock
Spooner-----	5	0-2	337-429	660-960	Drainageway, flat, lake plain, and upland	Silty glaciolacustrine deposits
2srqz: Canthook-----	30	0-6	337-429	660-960	Flat, lake plain, and upland	Sandy glaciolacustrine deposits over silty and clayey glaciolacustrine deposits
Durkeelake-----	30	0-12	337-429	660-960	Lake plain, rise, and upland	Sandy glaciolacustrine deposits over silty and clayey glaciolacustrine deposits
Bootleg-----	10	0-2	337-429	660-960	Drainageway, flat, lake plain, and upland	Sandy glaciolacustrine deposits over silty and clayey glaciolacustrine deposits
Udipsamments-----	10	0-12	337-429	660-960	Hillslope, lake plain, and upland	Sandy glaciofluvial deposits
Grytal-----	10	0-3	337-429	660-960	Flat, lake plain, and upland	Sandy glaciofluvial deposits
Voyageurs-----	5	0-5	337-429	660-960	Flat, lake plain, and upland	Silty glaciolacustrine deposits over water-worked till over igneous rock
Aquepts, stony, moderately slow Ksat-----	5	0-2	337-429	660-960	Depression, lake plain, and upland	Loamy glaciolacustrine deposits
2srr3: Spooner-----	40	0-2	337-429	660-960	Drainageway, flat, lake plain, and upland	Silty glaciolacustrine deposits

# Soil Survey of Voyageurs National Park, Minnesota

Table 6.—Climate, Landform, Landscape, and Parent Material—Continued

Map unit symbol and soil name	Pct. of map unit	Slope	Elevation	MAP	Landform and/or landscape	Parent material
	Pct	Pct	Meters	Cm		
2srr3: Sax-----	35	0-1	337-429	660-960	Depression, lake plain, and upland	Herbaceous organic material over silty glaciolacustrine deposits
Spooner, till/bedrock substratum-----	5	0-3	337-429	660-960	Drainageway, flat, lake plain, and upland	Silty glaciolacustrine deposits over water-worked till over igneous rock
Foglake-----	5	0-2	337-429	660-960	Drainageway, flat, lake plain, and upland	Clayey glaciolacustrine deposits
Little Swan-----	5	0-4	337-429	660-960	Flat, lake plain, and upland	Silty glaciolacustrine deposits
Bootleg-----	5	0-2	337-429	660-960	Drainageway, flat, lake plain, and upland	Sandy glaciolacustrine deposits over silty and clayey glaciolacustrine deposits
Canthook-----	5	0-4	337-429	660-960	Flat, lake plain, and upland	Sandy glaciolacustrine deposits over silty and clayey glaciolacustrine deposits
2srr4: Little Swan-----	40	0-3	337-429	660-960	Flat, lake plain, and upland	Silty glaciolacustrine deposits
Spooner-----	25	0-2	337-429	660-960	Drainageway, flat, lake plain, and upland	Silty glaciolacustrine deposits
Voyageurs-----	10	0-5	337-429	660-960	Flat, lake plain, and upland	Silty glaciolacustrine deposits over water-worked till over igneous rock
Spooner, till/bedrock substratum-----	5	0-3	337-429	660-960	Drainageway, flat, lake plain, and upland	Silty glaciolacustrine deposits over water-worked till over igneous rock

# Soil Survey of Voyageurs National Park, Minnesota

Table 6.—Climate, Landform, Landscape, and Parent Material—Continued

Map unit symbol and soil name	Pct. of map unit	Slope	Elevation	MAP	Landform and/or landscape	Parent material
	Pct	Pct	Meters	Cm		
2srr4: Sax-----	5	0-1	337-429	660-960	Depression, lake plain, and upland	Herbaceous organic material over silty glaciolacustrine deposits
Foglake-----	5	0-2	337-429	660-960	Drainageway, flat, lake plain, and upland	Clayey glaciolacustrine deposits
Bootleg-----	5	0-2	337-429	660-960	Drainageway, flat, lake plain, and upland	Sandy glaciolacustrine deposits over silty and clayey glaciolacustrine deposits
Canthook-----	5	0-4	337-429	660-960	Flat, lake plain, and upland	Sandy glaciolacustrine deposits over silty and clayey glaciolacustrine deposits
2srr7: Mooselake-----	80	0-1	337-429	660-960	Fen, lake plain, and upland	Woody organic material
Tacoosh, moat-----	10	0-1	337-429	660-960	Fen, lake plain, rim, and upland	Herbaceous organic material over silty glaciolacustrine deposits
Rifle-----	5	0-1	337-429	660-960	Fen, lake plain, and upland	Herbaceous organic material
Cathro, moat-----	5	0-1	337-429	660-960	Fen, lake plain, rim, and upland	Organic material over loamy drift
2srr8: Rifle-----	80	0-1	337-429	660-960	Fen, lake plain, and upland	Herbaceous organic material
Tacoosh, moat-----	10	0-1	337-429	660-960	Fen, lake plain, rim, and upland	Herbaceous organic material over silty glaciolacustrine deposits
Greenwood-----	5	0-1	337-429	660-960	Bog, lake plain, and upland	Mossy organic material over herbaceous organic material



# Soil Survey of Voyageurs National Park, Minnesota

Table 6.—Climate, Landform, Landscape, and Parent Material—Continued

Map unit symbol and soil name	Pct. of map unit	Slope	Elevation	MAP	Landform and/or landscape	Parent material
	<u>Pct</u>	<u>Pct</u>	<u>Meters</u>	<u>Cm</u>		
2srr8: Aquepts, stony, moderately slow Ksat-----	5	0-2	337-429	660-960	Depression, lake plain, and upland	Loamy glaciolacustrine deposits
2srr9: Tacoosh, frequently flooded	40	0-1	337-429	660-960	Fen, lake plain, and upland	Herbaceous organic material over silty glaciolacustrine deposits
Sax, frequently flooded-----	35	0-1	337-429	660-960	Depression, lake plain, and upland	Herbaceous organic material over silty glaciolacustrine deposits
Cathro, frequently flooded-----	10	0-1	337-429	660-960	Depression, drainageway, lake plain, and upland	Organic material over loamy drift
Rifle, frequently flooded-----	10	0-1	337-429	660-960	Fen, lake plain, and upland	Herbaceous organic material
Hassman, frequently flooded	5	0-1	337-429	660-960	Drainageway, lake plain, and upland	Clayey glaciolacustrine deposits
2srrb: Aquepts, ponded----	30	0-1	337-429	660-960	Drainageway, lake plain, pond, and upland	Loamy alluvium
Sax, ponded-----	25	0-1	337-429	660-960	Depression, lake plain, and upland	Herbaceous organic material over silty glaciolacustrine deposits
Tacoosh, ponded----	25	0-1	337-429	660-960	Fen, lake plain, and upland	Herbaceous organic material over silty glaciolacustrine deposits
Rifle, ponded-----	10	0-1	337-429	660-960	Fen, lake plain, and upland	Herbaceous organic material

# Soil Survey of Voyageurs National Park, Minnesota

Table 6.—Climate, Landform, Landscape, and Parent Material—Continued

Map unit symbol and soil name	Pct. of map unit	Slope	Elevation	MAP	Landform and/or landscape	Parent material
	Pct	Pct	Meters	Cm		
2srrb: Hassman, ponded----	10	0-1	337-429	660-960	Drainageway, lake plain, and upland	Clayey glaciolacustrine deposits
2srrh: Greenwood, seasonally ponded	80	0-1	337-429	660-960	Fen, lake plain, and upland	Mossy organic material over herbaceous organic material
Merwin, seasonally ponded-----	10	0-1	337-429	660-960	Fen, lake plain, and upland	Herbaceous organic material over loamy glaciolacustrine deposits
Rifle, seasonally ponded-----	5	0-1	337-429	660-960	Fen, lake plain, and upland	Herbaceous organic material
Tacoosh, seasonally ponded	5	0-1	337-429	660-960	Fen, lake plain, and upland	Herbaceous organic material over silty glaciolacustrine deposits
2srrj: Rifle, seasonally ponded-----	80	0-1	337-429	660-960	Fen, lake plain, and upland	Herbaceous organic material
Tacoosh, seasonally ponded	10	0-1	337-429	660-960	Fen, lake plain, and upland	Herbaceous organic material over silty glaciolacustrine deposits
Greenwood, seasonally ponded	5	0-1	337-429	660-960	Fen, lake plain, and upland	Mossy organic material over herbaceous organic material
Aquepts, stony, moderately slow Ksat-----	5	0-2	337-429	660-960	Depression, lake plain, and upland	Loamy glaciolacustrine deposits
2srrk: Insula, very stony, skeletal---	30	2-25	337-429	660-960	Moraine and upland	Coarse-loamy till over igneous rock

# Soil Survey of Voyageurs National Park, Minnesota

Table 6.—Climate, Landform, Landscape, and Parent Material—Continued

Map unit symbol and soil name	Pct. of map unit	Slope	Elevation	MAP	Landform and/or landscape	Parent material
	Pct	Pct	Meters	Cm		
2srrk: Conic, very stony, skeletal-----	16	2-25	337-429	660-960	Moraine and upland	Coarse-loamy till over igneous rock
Wahlsten, very stony-----	15	1-8	337-429	660-960	Moraine and upland	Coarse-loamy till over igneous rock
Quetico, very stony, skeletal---	10	2-25	337-429	660-960	Moraine and upland	Coarse-loamy till over igneous rock
Metonga, very stony, skeletal---	9	0-12	337-429	660-960	Moraine and upland	Coarse-loamy till over igneous rock
Dishno, very stony, skeletal---	9	0-8	337-429	660-960	Moraine and upland	Coarse-loamy till over igneous rock
Aquepts, very rubblly-----	3	0-2	337-429	660-960	Drainageway, moraine, and upland	Coarse-loamy till
Aquepts, stony, moderately slow Ksat-----	2	0-2	337-429	660-960	Depression, lake plain, and upland	Loamy glaciolacustrine deposits
Voyageurs-----	2	0-5	337-429	660-960	Flat, lake plain, and upland	Silty glaciolacustrine deposits over water-worked till over igneous rock
Rock outcrop-----	2	0-12	337-429	660-960	Hillslope and upland	None assigned
Foglake-----	1	0-2	337-429	660-960	Drainageway, flat, lake plain, and upland	Clayey glaciolacustrine deposits
Eaglesnest, very stony-----	1	0-12	337-429	660-960	Moraine and upland	Coarse-loamy till over dense till
2srll: Tacoosh, occasionally flooded-----	40	0-1	337-429	660-960	Fen, lake plain, and upland	Herbaceous organic material over silty glaciolacustrine deposits

# Soil Survey of Voyageurs National Park, Minnesota

Table 6.—Climate, Landform, Landscape, and Parent Material—Continued

Map unit symbol and soil name	Pct. of map unit	Slope	Elevation	MAP	Landform and/or landscape	Parent material
	Pct	Pct	Meters	Cm		
2srrl: Sax, occasionally flooded-----	35	0-1	337-429	660-960	Depression, lake plain, and upland	Herbaceous organic material over silty glaciolacustrine deposits
Cathro, occasionally flooded-----	10	0-1	337-429	660-960	Depression, drainageway, lake plain, and upland	Organic material over loamy drift
Rifle, occasionally flooded-----	10	0-1	337-429	660-960	Fen, lake plain, and upland	Herbaceous organic material
Hassman, occasionally flooded-----	5	0-1	337-429	660-960	Drainageway, lake plain, and upland	Clayey glaciolacustrine deposits
2srrm: Brickton-----	40	0-2	337-429	660-960	Drainageway, flat, lake plain, and upland	Clayey glaciolacustrine deposits
Hassman-----	35	0-1	337-429	660-960	Depression, lake plain, and upland	Clayey glaciolacustrine deposits
Spooner, till/bedock substratum-----	5	0-3	337-429	660-960	Drainageway, flat, lake plain, and upland	Silty glaciolacustrine deposits over water-worked till over igneous rock
Foglake-----	5	0-2	337-429	660-960	Drainageway, flat, lake plain, and upland	Clayey glaciolacustrine deposits
Dalbo-----	5	0-3	337-429	660-960	Flat, lake plain, and upland	Clayey glaciolacustrine deposits
Bootleg-----	5	0-2	337-429	660-960	Drainageway, flat, lake plain, and upland	Sandy glaciolacustrine deposits over silty and clayey glaciolacustrine deposits

# Soil Survey of Voyageurs National Park, Minnesota

Table 6.—Climate, Landform, Landscape, and Parent Material—Continued

Map unit symbol and soil name	Pct. of map unit	Slope	Elevation	MAP	Landform and/or landscape	Parent material
	<u>Pct</u>	<u>Pct</u>	<u>Meters</u>	<u>Cm</u>		
2srrm: Tacoosh-----	5	0-1	337-429	660-960	Fen, lake plain, and upland	Herbaceous organic material over silty glaciolacustrine deposits
2srrn: Brickton-----	60	0-2	337-429	660-960	Drainageway, flat, lake plain, and upland	Clayey glaciolacustrine deposits
Dalbo-----	15	0-3	337-429	660-960	Flat, lake plain, and upland	Clayey glaciolacustrine deposits
Voyageurs-----	5	0-5	337-429	660-960	Flat, lake plain, and upland	Silty glaciolacustrine deposits over water-worked till over igneous rock
Foglake-----	5	0-2	337-429	660-960	Drainageway, flat, lake plain, and upland	Clayey glaciolacustrine deposits
Spooner, till/bedrock substratum-----	5	0-3	337-429	660-960	Drainageway, flat, lake plain, and upland	Silty glaciolacustrine deposits over water-worked till over igneous rock
Bootleg-----	5	0-2	337-429	660-960	Drainageway, flat, lake plain, and upland	Sandy glaciolacustrine deposits over silty and clayey glaciolacustrine deposits
Hassman-----	5	0-1	337-429	660-960	Depression, lake plain, and upland	Clayey glaciolacustrine deposits
2srrq: Cathro, ponded----	60	0-1	337-429	660-960	Depression, drainageway, lake plain, and upland	Organic material over loamy drift
Tacoosh, ponded----	30	0-1	337-429	660-960	Fen, lake plain, and upland	Herbaceous organic material over silty glaciolacustrine deposits



# Soil Survey of Voyageurs National Park, Minnesota

Table 6.—Climate, Landform, Landscape, and Parent Material—Continued

Map unit symbol and soil name	Pct. of map unit	Slope	Elevation	MAP	Landform and/or landscape	Parent material
	Pct	Pct	Meters	Cm		
2srrq: Sax, ponded-----	5	0-1	337-429	660-960	Depression, lake plain, and upland	Herbaceous organic material over silty glaciolacustrine deposits
Aquepts, stony, moderately slow Ksat-----	5	0-2	337-429	660-960	Depression, lake plain, and upland	Loamy glaciolacustrine deposits
2srrr: Insula, very stony, skeletal---	30	2-12	337-429	660-960	Moraine and upland	Coarse-loamy till over igneous rock
Voyageurs-----	20	0-5	337-429	660-960	Flat, lake plain, and upland	Silty glaciolacustrine deposits over water-worked till over igneous rock
Wahlsten, very stony-----	15	1-8	337-429	660-960	Moraine and upland	Coarse-loamy till over igneous rock
Conic, very stony, skeletal-----	10	2-12	337-429	660-960	Moraine and upland	Coarse-loamy till over igneous rock
Spooner, till/bedrock substratum-----	8	0-3	337-429	660-960	Drainageway, flat, lake plain, and upland	Silty glaciolacustrine deposits over water-worked till over igneous rock
Brickton-----	5	0-2	337-429	660-960	Drainageway, flat, lake plain, and upland	Clayey glaciolacustrine deposits
Dishno, very stony, skeletal---	5	0-8	337-429	660-960	Moraine and upland	Coarse-loamy till over igneous rock
Aquepts, very rubby-----	3	0-2	337-429	660-960	Drainageway, moraine, and upland	Coarse-loamy till
Aquepts, stony, moderately slow Ksat-----	2	0-2	337-429	660-960	Depression, lake plain, and upland	Loamy glaciolacustrine deposits

# Soil Survey of Voyageurs National Park, Minnesota

Table 6.—Climate, Landform, Landscape, and Parent Material—Continued

Map unit symbol and soil name	Pct. of map unit	Slope	Elevation	MAP	Landform and/or landscape	Parent material
	<u>Pct</u>	<u>Pct</u>	<u>Meters</u>	<u>Cm</u>		
2srrr: Rock outcrop-----	2	0-12	337-429	660-960	Hillslope and upland	None assigned
2srtr: Bowstring, frequently flooded	50	0-1	337-429	660-960	Drainageway, lake plain, and upland	Herbaceous organic material over stratified loamy herbaceous organic material over loamy alluvium
Fluvaquents, frequently flooded	40	0-2	337-429	660-960	Drainageway, lake plain, and upland	Loamy alluvium
Cathro, frequently flooded-----	10	0-1	337-429	660-960	Depression, drainageway, lake plain, and upland	Organic material over loamy drift
W. Water						

# Soil Survey of Voyageurs National Park, Minnesota

Table 7.-Land Capability Classification

(Land capability classification is a system of grouping soils primarily on the basis of their capability to produce common cultivated crops and pasture plants without deteriorating over a long period of time. The classification is for nonirrigated areas)

Map unit symbol and component name	Land capability
2srmd:	
Quetico, bouldery-----	7s
Insula, bouldery-----	6s
Rock outcrop-----	8s
Wahlsten, bouldery, skeletal-----	6s
Conic, bouldery, skeletal-----	6e
Arcadian, very stony-----	7s
2srqm:	
Quetico, bouldery-----	7s
Insula, bouldery-----	6s
Rock outcrop-----	8s
Conic, bouldery, skeletal-----	6e
Arcadian, very stony-----	7s
2srqn:	
Insula, very bouldery, skeletal-----	6e
Conic, very bouldery, skeletal-----	6e
Rock outcrop-----	8s
Metonga, very stony, skeletal-----	6s
Quetico, very bouldery, skeletal-----	7e
Wahlsten, very stony-----	6s
Voyageurs-----	2w
Aquepts, very rubbly-----	8s
2srqp:	
Quetico, very bouldery, skeletal-----	7s
Insula, very bouldery, skeletal-----	6s
Greenwood-----	7w
Rock outcrop-----	8s
Merwin-----	7w
Aquepts, very rubbly-----	8s
Wahlsten, very stony-----	6s
Conic, very bouldery, skeletal-----	6s

# Soil Survey of Voyageurs National Park, Minnesota

Table 7.-Land Capability Classification--Continued

Map unit symbol and component name	Land capability
2srqr:	
Greenwood-----	7w
Merwin-----	7w
Rifle, moat-----	7w
Tacoosh, moat-----	7w
2srqs:	
Insula, very stony, skeletal-----	6s
Conic, very stony, skeletal-----	6s
Wahlsten, very stony-----	6s
Quetico, very stony, skeletal-----	7s
Metonga, very stony, skeletal-----	6s
Dishno, very stony, skeletal-----	6s
Aquepts, very rubbly-----	8s
Aquepts, stony, moderately slow Ksat-----	6w
Voyageurs-----	2w
Rock outcrop-----	8s
Foglake-----	3w
Eaglesnest, very stony-----	6s
2srqv:	
Voyageurs, oxyaquic-----	2e
Conic, very stony, skeletal-----	6s
Littleswan-----	2w
Insula, very stony, skeletal-----	6s
Wahlsten, very stony-----	6s
Metonga, very stony, skeletal-----	6s
Baudette-----	2e
Aquepts, stony, moderately slow Ksat-----	6w
Rock outcrop-----	8s

# Soil Survey of Voyageurs National Park, Minnesota

Table 7.-Land Capability Classification--Continued

Map unit symbol and component name	Land capability
2srqw:	
Wahlsten, very stony-----	6s
Spooner-----	3w
Voyageurs-----	2w
Insula, very stony, skeletal-----	6s
Dishno, very stony, skeletal-----	6s
Aquepts, stony, moderately slow Ksat-----	6w
Littleswan-----	2w
Aquepts, very rubbly-----	8s
Rock outcrop-----	8s
2srqy:	
Baudette-----	2e
Littleswan-----	2w
Voyageurs-----	2w
Wahlsten, very stony-----	6s
Insula, very stony, skeletal-----	6s
Spooner-----	3w
2srqz:	
Canthook-----	2w
Durkeelake-----	2e
Bootleg-----	3w
Udipsamments-----	4s
Grytal-----	4s
Voyageurs-----	2w
Aquepts, stony, moderately slow Ksat-----	6w
2srr3:	
Spooner-----	3w
Sax-----	6w
Spooner, till/bedrock substratum-----	3w
Foglake-----	3w
Littleswan-----	2w
Bootleg-----	3w
Canthook-----	2w



# Soil Survey of Voyageurs National Park, Minnesota

Table 7.-Land Capability Classification--Continued

Map unit symbol and component name	Land capability
2srr4:	
Littleswan-----	2w
Spoonier-----	3w
Voyageurs-----	2w
Spoonier, till/bedrock substratum-----	3w
Sax-----	6w
Foglake-----	3w
Bootleg-----	3w
Canthook-----	2w
2srr7:	
Mooselake-----	7w
Tacoosh, moat-----	7w
Rifle-----	7w
Cathro, moat-----	7w
2srr8:	
Rifle-----	7w
Tacoosh, moat-----	7w
Greenwood-----	7w
Aquepts, stony, moderately slow Ksat-----	6w
2srr9:	
Tacoosh, frequently flooded-----	8w
Sax, frequently flooded-----	8w
Cathro, frequently flooded-----	8w
Rifle, frequently flooded-----	8w
Hassman, frequently flooded-----	8w
2srrb:	
Aquepts, ponded-----	8w
Sax, ponded-----	6w
Tacoosh, ponded-----	8w
Rifle, ponded-----	8w
Hassman, ponded-----	6w
2srrh:	
Greenwood, seasonally ponded-----	8w
Merwin, seasonally ponded-----	8w
Rifle, seasonally ponded-----	8w
Tacoosh, seasonally ponded-----	8w

# Soil Survey of Voyageurs National Park, Minnesota

Table 7.-Land Capability Classification--Continued

Map unit symbol and component name	Land capability
2srrj:	
Rifle, seasonally ponded-----	8w
Tacoosh, seasonally ponded-----	8w
Greenwood, seasonally ponded-----	8w
Aquepts, stony, moderately slow Ksat-----	6w
2srrk:	
Insula, very stony, skeletal-----	6e
Conic, very stony, skeletal-----	6s
Wahlsten, very stony-----	6s
Quetico, very stony, skeletal-----	7e
Metonga, very stony, skeletal-----	6s
Dishno, very stony, skeletal-----	6s
Aquepts, very rubbly-----	8s
Aquepts, stony, moderately slow Ksat-----	6w
Voyageurs-----	2w
Rock outcrop-----	8s
Foglake-----	3w
Eaglesnest, very stony-----	6s
2srri:	
Tacoosh, occasionally flooded-----	7w
Sax, occasionally flooded-----	7w
Cathro, occasionally flooded-----	7w
Rifle, occasionally flooded-----	7w
Hassman, occasionally flooded-----	7w
2srrm:	
Brickton-----	3w
Hassman-----	6w
Spooner, till/bedrock substratum-----	3w
Foglake-----	3w
Dalbo-----	2w
Bootleg-----	3w
Tacoosh-----	7w

# Soil Survey of Voyageurs National Park, Minnesota

Table 7.-Land Capability Classification-Continued

Map unit symbol and component name	Land capability
2srrn:	
Brickton-----	3w
Dalbo-----	2w
Voyageurs-----	2w
Foglake-----	3w
Spooner, till/bedrock substratum-----	3w
Bootleg-----	3w
Hassman-----	6w
2srrq:	
Cathro, ponded-----	8w
Tacoosh, ponded-----	8w
Sax, ponded-----	6w
Aquepts, stony, moderately slow Ksat-----	6w
2srrr:	
Insula, very stony, skeletal-----	6s
Voyageurs-----	2w
Wahlsten, very stony-----	6s
Conic, very stony, skeletal-----	6s
Spooner, till/bedrock substratum-----	3w
Brickton-----	3w
Dishno, very stony, skeletal-----	6s
Aquepts, very rubbly-----	8s
Aquepts, stony, moderately slow Ksat-----	6w
Rock outcrop-----	8s
2srtr:	
Bowstring, frequently flooded-----	8w
Fluvaquents, frequently flooded-----	5w
Cathro, frequently flooded-----	7w
W. Water	

# Soil Survey of Voyageurs National Park, Minnesota

Table 8.—Hydric Soils

(This report lists only those map unit components that are rated as hydric. Definitions of hydric criteria codes are included at the end of the report)

Map symbol and map unit name	Component	Percent of map unit	Hydric rating	Landform	Hydric soils criteria			
					Hydric criteria code	Meets saturation criteria	Meets flooding criteria	Meets ponding criteria
2srqn: Insula-Conic-Rock outcrop complex, 8 to 25 percent slopes, very bouldery	Aquepts, very rubbly	2	Yes	drainageways on bedrock-controlled moraines	2, 3	Yes	No	Yes
2srqp: Quetico-Insula, very bouldery-Greenwood complex, 0 to 12 percent slopes, very rocky	Greenwood	15	Yes	bogs on lake plains	1	Yes	No	No
	Merwin	5	Yes	bogs on lake plains	1	Yes	No	No
	Aquepts, very rubbly	5	Yes	drainageways on bedrock-controlled moraines	3, 2	Yes	No	Yes
2srqr: Greenwood peat, 0 to 1 percent slopes	Greenwood	80	Yes	bogs on lake plains	1	Yes	No	No
	Merwin	10	Yes	bogs on lake plains	1	Yes	No	No
	Rifle, moat	5	Yes	moat rims on fens on lake plains	3, 1	Yes	No	Yes
	Tacoosh, moat	5	Yes	moat rims on fens on lake plains	1, 3	Yes	No	Yes
2srqs: Insula-Conic-Wahlsten complex, 0 to 12 percent slopes, very stony, very rocky	Aquepts, very rubbly	3	Yes	drainageways on bedrock-controlled moraines	2, 3	Yes	No	Yes
	Aquepts, stony, moderately slow Ksat	2	Yes	depressions on lake plains	2, 3	Yes	No	Yes
	Foglake	1	Yes	flats and drainageways on lake plains	2	Yes	No	No

Soil Survey of Voyageurs National Park, Minnesota

Table 8.—Hydric Soils—Continued

Map symbol and map unit name	Component	Percent of map unit	Hydric rating	Landform	Hydric soils criteria			
					Hydric criteria code	Meets saturation criteria	Meets flooding criteria	Meets ponding criteria
2srqv: Voyageurs, oxyaquic-Conic, very stony-Littleswan complex, 0 to 12 percent slopes, rocky	Aquepts, stony, moderately slow Ksat	4	Yes	depressions on lake plains	2, 3	Yes	No	Yes
2srqw: Wahlsten, very stony-Spooner-Voyageurs complex, 0 to 8 percent slopes, rocky	Spooner	24	Yes	flats and drainageways on lake plains	2	Yes	No	No
	Aquepts, stony, moderately slow Ksat	3	Yes	depressions on lake plains	3, 2	Yes	No	Yes
	Aquepts, very rubbly	2	Yes	drainageways on bedrock-controlled moraines	2, 3	Yes	No	Yes
2srqy: Baudette-Littleswan complex, 0 to 8 percent slopes	Spooner	5	Yes	flats and drainageways on lake plains	2	Yes	No	No
2srqz: Canthook-Durkeelake complex, 0 to 12 percent slopes	Bootleg	10	Yes	flats and drainageways on lake plains	2	Yes	No	No
	Aquepts, stony, moderately slow Ksat	5	Yes	depressions on lake plains	2, 3	Yes	No	Yes



# Soil Survey of Voyageurs National Park, Minnesota

Table 8.—Hydric Soils—Continued

Map symbol and map unit name	Component	Percent of map unit	Hydric rating	Landform	Hydric soils criteria			
					Hydric criteria code	Meets saturation criteria	Meets flooding criteria	Meets ponding criteria
2srr3: Spooners-Sax complex, 0 to 2 percent slopes	Spooners	40	Yes	flats and drainageways on lake plains	2	Yes	No	No
	Sax	35	Yes	depressions on lake plains	3, 2	Yes	No	Yes
	Spooners, till/bedrock substratum	5	Yes	flats and drainageways on lake plains	2	Yes	No	No
	Foglake	5	Yes	flats and drainageways on lake plains	2	Yes	No	No
	Bootleg	5	Yes	flats and drainageways on lake plains	2	Yes	No	No
2srr4: Littleswan-Spooners complex, 0 to 3 percent slopes	Spooners	25	Yes	flats and drainageways on lake plains	2	Yes	No	No
	Spooners, till/bedrock substratum	5	Yes	flats and drainageways on lake plains	2	Yes	No	No
	Sax	5	Yes	depressions on lake plains	2, 3	Yes	No	Yes
	Foglake	5	Yes	flats and drainageways on lake plains	2	Yes	No	No
	Bootleg	5	Yes	flats and drainageways on lake plains	2	Yes	No	No

Soil Survey of Voyageurs National Park, Minnesota

Table 8.—Hydric Soils—Continued

Map symbol and map unit name	Component	Percent of map unit	Hydric rating	Landform	Hydric soils criteria			
					Hydric criteria code	Meets saturation criteria	Meets flooding criteria	Meets ponding criteria
2srr7: Mooselake mucky peat, 0 to 1 percent slopes	Mooselake	80	Yes	cedar fens on lake plains	1	Yes	No	No
	Tacoosh, moat	10	Yes	moat rims on fens on lake plains	3, 1	Yes	No	Yes
	Rifle	5	Yes	fens on lake plains	1	Yes	No	No
	Cathro, moat	5	Yes	moat rims on fens on lake plains	3, 1	Yes	No	Yes
2srr8: Rifle mucky peat, 0 to 1 percent slopes	Rifle	80	Yes	fens on lake plains	1	Yes	No	No
	Tacoosh, moat	10	Yes	moat rims on fens on lake plains	1, 3	Yes	No	Yes
	Greenwood	5	Yes	bogs on lake plains	1	Yes	No	No
	Aquepts, stony, moderately slow Ksat	5	Yes	depressions on lake plains	2, 3	Yes	No	Yes
2srr9: Tacoosh and Sax soils, 0 to 1 percent slopes, frequently flooded	Tacoosh, frequently flooded	40	Yes	fens on lake plains	4, 1	Yes	Yes	No
	Sax, frequently flooded	35	Yes	depressions on lake plains	4, 2	Yes	Yes	No
	Cathro, frequently flooded	10	Yes	depressions and drainageways on lake plains	1, 4	Yes	Yes	No
	Rifle, frequently flooded	10	Yes	fens on lake plains	1, 4	Yes	Yes	No
	Hassman, frequently flooded	5	Yes	drainageways on lake plains	2, 4	Yes	Yes	No

Soil Survey of Voyageurs National Park, Minnesota

Table 8.—Hydric Soils—Continued

Map symbol and map unit name	Component	Percent of map unit	Hydric rating	Landform	Hydric soils criteria			
					Hydric criteria code	Meets saturation criteria	Meets flooding criteria	Meets ponding criteria
2srrb: Aquepts, Sax, and Tacoosh soils, 0 to 1 percent slopes, ponded	Aquepts, ponded	30	Yes	ponds on drainageways on lake plains	2, 3	Yes	No	Yes
	Sax, ponded	25	Yes	depressions on lake plains	3, 2	Yes	No	Yes
	Tacoosh, ponded	25	Yes	fens on lake plains	1, 3	Yes	No	Yes
	Rifle, ponded	10	Yes	fens on lake plains	1, 3	Yes	No	Yes
	Hassman, ponded	10	Yes	drainageways on lake plains	3, 2	Yes	No	Yes
2srrh: Greenwood peat, 0 to 1 percent slopes, seasonally ponded	Greenwood, seasonally ponded	80	Yes	acidic fens on lake plains	1, 3	Yes	No	Yes
	Merwin, seasonally ponded	10	Yes	acidic fens on lake plains	3, 1	Yes	No	Yes
	Rifle, seasonally ponded	5	Yes	fens on lake plains	3, 1	Yes	No	Yes
	Tacoosh, seasonally ponded	5	Yes	fens on lake plains	1, 3	Yes	No	Yes
2srrj: Rifle mucky peat, 0 to 1 percent slopes seasonally ponded	Rifle, seasonally ponded	80	Yes	fens on lake plains	3, 1	Yes	No	Yes
	Tacoosh, seasonally ponded	10	Yes	fens on lake plains	3, 1	Yes	No	Yes
	Greenwood, seasonally ponded	5	Yes	acidic fens on lake plains	1, 3	Yes	No	Yes
	Aquepts, stony, moderately slow Ksat	5	Yes	depressions on lake plains	3, 2	Yes	No	Yes

Soil Survey of Voyageurs National Park, Minnesota

Table 8.—Hydric Soils—Continued

Map symbol and map unit name	Component	Percent of map unit	Hydric rating	Landform	Hydric soils criteria			
					Hydric criteria code	Meets saturation criteria	Meets flooding criteria	Meets ponding criteria
2srrk: Insula-Conic-Wahlsten complex, 0 to 25 percent slopes, very stony, very rocky	Aquepts, very rubbly	3	Yes	drainageways on bedrock-controlled moraines	2, 3	Yes	No	Yes
	Aquepts, stony, moderately slow Ksat	2	Yes	depressions on lake plains	2, 3	Yes	No	Yes
	Foglake	1	Yes	flats and drainageways on lake plains	2	Yes	No	No
2srrl: Tacoosh and Sax soils, 0 to 1 percent slopes, occasionally flooded	Tacoosh, occasionally flooded	40	Yes	fens on lake plains	1	Yes	No	No
	Sax, occasionally flooded	35	Yes	depressions on lake plains	2	Yes	No	No
	Cathro, occasionally flooded	10	Yes	depressions and drainageways on lake plains	1	Yes	No	No
	Rifle, occasionally flooded	10	Yes	fens on lake plains	1	Yes	No	No
	Hassman, occasionally flooded	5	Yes	drainageways on lake plains	2	Yes	No	No

# Soil Survey of Voyageurs National Park, Minnesota

Table 8.—Hydric Soils—Continued

Map symbol and map unit name	Component	Percent of map unit	Hydric rating	Landform	Hydric soils criteria			
					Hydric criteria code	Meets saturation criteria	Meets flooding criteria	Meets ponding criteria
2srrm: Brickton-Hassman complex, 0 to 2 percent slopes	Brickton	40	Yes	flats and drainageways on lake plains	2	Yes	No	No
	Hassman	35	Yes	depressions on lake plains	3, 2	Yes	No	Yes
	Spooner, till/bedrock substratum	5	Yes	flats and drainageways on lake plains	2	Yes	No	No
	Foglake	5	Yes	flats and drainageways on lake plains	2	Yes	No	No
	Bootleg	5	Yes	flats and drainageways on lake plains	2	Yes	No	No
	Tacoosh	5	Yes	fens on lake plains	3, 1	Yes	No	Yes
2srrn: Brickton-Dalbo complex, 0 to 3 percent slopes	Brickton	60	Yes	flats and drainageways on lake plains	2	Yes	No	No
	Foglake	5	Yes	flats and drainageways on lake plains	2	Yes	No	No
	Spooner, till/bedrock substratum	5	Yes	flats and drainageways on lake plains	2	Yes	No	No
	Bootleg	5	Yes	flats and drainageways on lake plains	2	Yes	No	No
	Hassman	5	Yes	depressions on lake plains	2, 3	Yes	No	Yes



Soil Survey of Voyageurs National Park, Minnesota

Table 8.—Hydric Soils—Continued

Map symbol and map unit name	Component	Percent of map unit	Hydric rating	Landform	Hydric soils criteria			
					Hydric criteria code	Meets saturation criteria	Meets flooding criteria	Meets ponding criteria
2srrq: Cathro and Tacoosh soils, 0 to 1 percent slopes, ponded	Cathro, ponded	60	Yes	depressions and drainageways on lake plains	3, 1	Yes	No	Yes
	Tacoosh, ponded	30	Yes	fens on lake plains	1, 3	Yes	No	Yes
	Sax, ponded	5	Yes	depressions on lake plains	3, 2	Yes	No	Yes
	Aquepts, stony, moderately slow Ksat	5	Yes	depressions on lake plains	2, 3	Yes	No	Yes
2srrr: Insula, very stony-Voyageurs-Wahlsten, very stony complex, 0 to 12 percent slopes, very rocky	Spooner, till/bedrock substratum	8	Yes	flats and drainageways on lake plains	2	Yes	No	No
	Brickton	5	Yes	flats and drainageways on lake plains	2	Yes	No	No
	Aquepts, very rubbly	3	Yes	drainageways on bedrock-controlled moraines	2, 3	Yes	No	Yes
	Aquepts, stony, moderately slow Ksat	2	Yes	depressions on lake plains	3, 2	Yes	No	Yes

# Soil Survey of Voyageurs National Park, Minnesota

Table 8.—Hydric Soils—Continued

Map symbol and map unit name	Component	Percent of map unit	Hydric rating	Landform	Hydric soils criteria			
					Hydric criteria code	Meets saturation criteria	Meets flooding criteria	Meets ponding criteria
2srrt: Bowstring and Fluvaquents soils, 0 to 2 percent slopes, frequently flooded	Bowstring, frequently flooded	50	Yes	drainageways on lake plains	4, 1, 2	Yes	Yes	No
	Fluvaquents, frequently flooded	40	Yes	drainageways on lake plains	4, 2	Yes	Yes	No
	Cathro, frequently flooded	10	Yes	depressions and drainageways on lake plains	1, 4	Yes	Yes	No

## Explanation of hydric criteria codes

1. All Histels (except for Folistels), and Histosols (except for Folists), which are, by definition, saturated.
2. Soils in Aquic suborders, great groups, or subgroups, Albolls suborder, Historthels great group, Histoturbels great group, Pachic subgroups, or Cumulic subgroups that:
  - A. are somewhat poorly drained and have a water table at the surface (0.0 feet) during the growing season, or
  - B. are poorly drained or very poorly drained and have either:
    - 1.) a water table at the surface (0.0 feet) during the growing season if textures are coarse sand, sand, or fine sand in all layers within a depth of 20 inches, or
    - 2.) a water table at a depth of 0.5 foot or less during the growing season if permeability is equal to or greater than 6.0 in/hr in all layers within a depth of 20 inches, or
    - 3.) a water table at a depth of 1.0 foot or less during the growing season if permeability is less than 6.0 in/hr in any layer within a depth of 20 inches.
3. Soils that are frequently ponded for periods of long or very long duration during the growing season.
4. Soils that are frequently flooded for periods of long or very long duration during the growing season.

# Soil Survey of Voyageurs National Park, Minnesota

Table 9.-Land Management, Part I (Planting)

(Onsite investigation may be needed to validate the interpretations in this table and to confirm the identity of the soil on a given site. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table)

Map unit symbol and soil name	Pct. of map unit	Suitability for hand planting		Suitability for mechanical planting		Soil rutting hazard	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srmd: Quetico, bouldery---	35	Unsuited Restrictive layer	1.00	Unsuited Restrictive layer Slope Rock fragments	1.00 0.50 0.50	Moderate Low strength	0.50
Insula, bouldery----	20	Unsuited Restrictive layer	1.00	Unsuited Restrictive layer Slope Rock fragments	1.00 0.50 0.50	Moderate Low strength	0.50
Rock outcrop-----	15	Not rated		Not rated		Not rated	
Wahlsten, bouldery, skeletal-----	10	Moderately suited Rock fragments	0.50	Poorly suited Rock fragments	0.75	Slight Strength	0.10
Conic, bouldery, skeletal-----	10	Moderately suited Rock fragments	0.50	Poorly suited Rock fragments Slope	0.75 0.50	Slight Strength	0.10
Arcadian, very stony	10	Moderately suited Rock fragments	0.50	Poorly suited Rock fragments Slope	0.75 0.50	Slight Strength	0.10
2srqm: Quetico, bouldery---	40	Unsuited Restrictive layer	1.00	Unsuited Restrictive layer Slope Rock fragments	1.00 0.75 0.50	Moderate Low strength	0.50
Insula, bouldery----	25	Unsuited Restrictive layer	1.00	Unsuited Restrictive layer Slope Rock fragments	1.00 0.75 0.50	Moderate Low strength	0.50
Rock outcrop-----	15	Not rated		Not rated		Not rated	
Conic, bouldery, skeletal-----	10	Moderately suited Rock fragments	0.50	Poorly suited Rock fragments Slope	0.75 0.50	Slight Strength	0.10
Arcadian, very stony	10	Moderately suited Rock fragments	0.50	Poorly suited Rock fragments Slope	0.75 0.75	Slight Strength	0.10
2srqn: Insula, very bouldery, skeletal	35	Moderately suited Rock fragments	0.50	Unsuited Rock fragments Slope	1.00 0.75	Moderate Low strength	0.50

# Soil Survey of Voyageurs National Park, Minnesota

Table 9.-Land Management, Part I (Planting)-Continued

Map unit symbol and soil name	Pct. of map unit	Suitability for hand planting		Suitability for mechanical planting		Soil rutting hazard	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srqn: Conic, very bouldery, skeletal	16	Moderately suited Rock fragments	0.50	Poorly suited Rock fragments Slope	0.75 0.50	Slight Strength	0.10
Rock outcrop-----	15	Not rated		Not rated		Not rated	
Metonga, very stony, skeletal----	14	Moderately suited Rock fragments	0.50	Poorly suited Rock fragments Slope	0.75 0.50	Slight Strength	0.10
Quetico, very bouldery, skeletal	10	Unsuited Restrictive layer Rock fragments	1.00 0.50	Unsuited Restrictive layer Rock fragments Slope	1.00 0.75 0.75	Slight Strength	0.10
Wahlsten, very stony	5	Moderately suited Rock fragments	0.50	Poorly suited Rock fragments	0.75	Slight Strength	0.10
Voyageurs-----	3	Moderately suited Stickiness; high plasticity index	0.50	Moderately suited Stickiness; high plasticity index	0.50	Severe Low strength	1.00
Aquepts, very rubbly	2	Unsuited Rock fragments	1.00	Unsuited Rock fragments	1.00	Slight Strength	0.10
2srqp: Quetico, very bouldery, skeletal	31	Unsuited Restrictive layer Rock fragments	1.00 0.50	Unsuited Restrictive layer Rock fragments Slope	1.00 0.75 0.50	Slight Strength	0.10
Insula, very bouldery, skeletal	30	Moderately suited Rock fragments	0.50	Unsuited Rock fragments Slope	1.00 0.50	Moderate Low strength	0.50
Greenwood-----	15	Moderately suited Wetness	0.50	Moderately suited Wetness	0.50	Severe Low strength Wetness	1.00 0.50
Rock outcrop-----	9	Not rated		Not rated		Not rated	
Merwin-----	5	Moderately suited Wetness	0.50	Moderately suited Wetness	0.50	Severe Low strength Wetness	1.00 0.50
Aquepts, very rubbly	5	Unsuited Rock fragments	1.00	Unsuited Rock fragments	1.00	Slight Strength	0.10
Wahlsten, very stony	3	Moderately suited Rock fragments	0.50	Poorly suited Rock fragments	0.75	Slight Strength	0.10
Conic, very bouldery, skeletal	2	Moderately suited Rock fragments	0.50	Poorly suited Rock fragments Slope	0.75 0.50	Slight Strength	0.10

# Soil Survey of Voyageurs National Park, Minnesota

Table 9.--Land Management, Part I (Planting)--Continued

Map unit symbol and soil name	Pct. of map unit	Suitability for hand planting		Suitability for mechanical planting		Soil rutting hazard	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srqr: Greenwood-----	80	Moderately suited Wetness	0.50	Moderately suited Wetness	0.50	Severe Low strength Wetness	1.00 0.50
Merwin-----	10	Moderately suited Wetness	0.50	Moderately suited Wetness	0.50	Severe Low strength Wetness	1.00 0.50
Rifle, moat-----	5	Moderately suited Wetness	0.50	Moderately suited Wetness	0.50	Severe Low strength Wetness	1.00 0.50
Tacoosh, moat-----	5	Moderately suited Wetness	0.50	Moderately suited Wetness	0.50	Severe Low strength Wetness	1.00 0.50
2srqs: Insula, very stony, skeletal-----	30	Moderately suited Rock fragments	0.50	Unsuited Rock fragments Slope	1.00 0.50	Moderate Low strength	0.50
Conic, very stony, skeletal-----	16	Moderately suited Rock fragments	0.50	Poorly suited Rock fragments Slope	0.75 0.50	Slight Strength	0.10
Wahlsten, very stony	15	Moderately suited Rock fragments	0.50	Poorly suited Rock fragments	0.75	Slight Strength	0.10
Quetico, very stony, skeletal----	10	Unsuited Restrictive layer Rock fragments	1.00 0.50	Unsuited Restrictive layer Rock fragments Slope	1.00 0.75 0.50	Slight Strength	0.10
Metonga, very stony, skeletal----	9	Moderately suited Rock fragments	0.50	Poorly suited Rock fragments Slope	0.75 0.50	Slight Strength	0.10
Dishno, very stony, skeletal-----	9	Moderately suited Rock fragments	0.50	Poorly suited Rock fragments Slope	0.75 0.50	Slight Strength	0.10
Aquepts, very rubbly	3	Unsuited Rock fragments	1.00	Unsuited Rock fragments	1.00	Slight Strength	0.10
Aquepts, stony, moderately slow Ksat-----	2	Well suited		Well suited		Severe Low strength	1.00
Voyageurs-----	2	Moderately suited Stickiness; high plasticity index	0.50	Moderately suited Stickiness; high plasticity index	0.50	Severe Low strength	1.00
Rock outcrop-----	2	Not rated		Not rated		Not rated	



# Soil Survey of Voyageurs National Park, Minnesota

Table 9.-Land Management, Part I (Planting)-Continued

Map unit symbol and soil name	Pct. of map unit	Suitability for hand planting		Suitability for mechanical planting		Soil rutting hazard	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srqs: Foglake-----	1	Poorly suited Stickiness; high plasticity index	0.75	Poorly suited Stickiness; high plasticity index	0.75	Severe Low strength	1.00
Eaglesnest, very stony-----	1	Well suited		Moderately suited Rock fragments Slope	0.50 0.50	Slight Strength	0.10
2srqv: Voyageurs, oxyaquic	35	Moderately suited Stickiness; high plasticity index	0.50	Moderately suited Stickiness; high plasticity index	0.50	Severe Low strength	1.00
Conic, very stony, skeletal-----	15	Moderately suited Rock fragments	0.50	Poorly suited Rock fragments Slope	0.75 0.50	Slight Strength	0.10
Little Swan-----	20	Well suited		Well suited		Severe Low strength	1.00
Insula, very stony, skeletal-----	10	Moderately suited Rock fragments	0.50	Unsuited Rock fragments Slope	1.00 0.50	Moderate Low strength	0.50
Wahlsten, very stony	5	Moderately suited Rock fragments	0.50	Poorly suited Rock fragments	0.75	Slight Strength	0.10
Metonga, very stony, skeletal----	5	Moderately suited Rock fragments	0.50	Poorly suited Rock fragments Slope	0.75 0.50	Slight Strength	0.10
Baudette-----	5	Moderately suited Stickiness; high plasticity index	0.50	Moderately suited Stickiness; high plasticity index	0.50	Severe Low strength	1.00
Aquepts, stony, moderately slow Ksat-----	4	Well suited		Well suited		Severe Low strength	1.00
Rock outcrop-----	1	Not rated		Not rated		Not rated	
2srqw: Wahlsten, very stony	26	Moderately suited Rock fragments	0.50	Poorly suited Rock fragments	0.75	Slight Strength	0.10
Spooner-----	24	Moderately suited Stickiness; high plasticity index	0.50	Moderately suited Stickiness; high plasticity index	0.50	Severe Low strength	1.00
Voyageurs-----	22	Moderately suited Stickiness; high plasticity index	0.50	Moderately suited Stickiness; high plasticity index	0.50	Severe Low strength	1.00

# Soil Survey of Voyageurs National Park, Minnesota

Table 9.--Land Management, Part I (Planting)--Continued

Map unit symbol and soil name	Pct. of map unit	Suitability for hand planting		Suitability for mechanical planting		Soil rutting hazard	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srqw: Insula, very stony, skeletal-----	10	Moderately suited Rock fragments	0.50	Unsuited Rock fragments Slope	1.00 0.50	Moderate Low strength	0.50
Dishno, very stony, skeletal-----	9	Moderately suited Rock fragments	0.50	Poorly suited Rock fragments Slope	0.75 0.50	Slight Strength	0.10
Aquepts, stony, moderately slow Ksat-----	3	Well suited		Well suited		Severe Low strength	1.00
Little Swan-----	3	Well suited		Well suited		Severe Low strength	1.00
Aquepts, very rubbly	2	Unsuited Rock fragments	1.00	Unsuited Rock fragments	1.00	Slight Strength	0.10
Rock outcrop-----	1	Not rated		Not rated		Not rated	
2srqy: Baudette-----	40	Moderately suited Stickiness; high plasticity index	0.50	Moderately suited Stickiness; high plasticity index	0.50	Severe Low strength	1.00
Little Swan-----	35	Well suited		Well suited		Severe Low strength	1.00
Voyageurs-----	10	Moderately suited Stickiness; high plasticity index	0.50	Moderately suited Stickiness; high plasticity index	0.50	Severe Low strength	1.00
Wahlsten, very stony	5	Moderately suited Rock fragments	0.50	Poorly suited Rock fragments	0.75	Slight Strength	0.10
Insula, very stony, skeletal-----	5	Moderately suited Rock fragments	0.50	Unsuited Rock fragments Slope	1.00 0.50	Moderate Low strength	0.50
Spooner-----	5	Moderately suited Stickiness; high plasticity index	0.50	Moderately suited Stickiness; high plasticity index	0.50	Severe Low strength	1.00
2srqz: Canthook-----	30	Moderately suited Stickiness; high plasticity index	0.50	Moderately suited Stickiness; high plasticity index	0.50	Moderate Low strength	0.50
Durkeelake-----	30	Well suited		Moderately suited Slope	0.50	Moderate Low strength	0.50
Bootleg-----	10	Well suited		Well suited		Severe Low strength	1.00

# Soil Survey of Voyageurs National Park, Minnesota

Table 9.-Land Management, Part I (Planting)-Continued

Map unit symbol and soil name	Pct. of map unit	Suitability for hand planting		Suitability for mechanical planting		Soil rutting hazard	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srqz: Udipsamments-----	10	Moderately suited Sandiness	0.50	Moderately suited Sandiness Slope	0.50 0.50	Moderate Low strength	0.50
Grytal-----	10	Moderately suited Sandiness	0.50	Moderately suited Sandiness	0.50	Severe Low strength	1.00
Voyageurs-----	5	Moderately suited Stickiness; high plasticity index	0.50	Moderately suited Stickiness; high plasticity index	0.50	Severe Low strength	1.00
Aquepts, stony, moderately slow Ksat-----	5	Well suited		Well suited		Severe Low strength	1.00
2srr3: Spooners-----	40	Moderately suited Stickiness; high plasticity index	0.50	Moderately suited Stickiness; high plasticity index	0.50	Severe Low strength	1.00
Sax-----	35	Moderately suited Wetness	0.50	Moderately suited Wetness	0.50	Severe Low strength Wetness	1.00 0.50
Spooners, till/bedrock substratum-----	5	Well suited		Well suited		Severe Low strength	1.00
Foglake-----	5	Poorly suited Stickiness; high plasticity index	0.75	Poorly suited Stickiness; high plasticity index	0.75	Severe Low strength	1.00
Littleswan-----	5	Well suited		Well suited		Severe Low strength	1.00
Bootleg-----	5	Well suited		Well suited		Severe Low strength	1.00
Canthook-----	5	Moderately suited Stickiness; high plasticity index	0.50	Moderately suited Stickiness; high plasticity index	0.50	Moderate Low strength	0.50
2srr4: Littleswan-----	40	Well suited		Well suited		Severe Low strength	1.00
Spooners-----	25	Moderately suited Stickiness; high plasticity index	0.50	Moderately suited Stickiness; high plasticity index	0.50	Severe Low strength	1.00
Voyageurs-----	10	Moderately suited Stickiness; high plasticity index	0.50	Moderately suited Stickiness; high plasticity index	0.50	Severe Low strength	1.00
Spooners, till/bedrock substratum-----	5	Well suited		Well suited		Severe Low strength	1.00

# Soil Survey of Voyageurs National Park, Minnesota

Table 9.-Land Management, Part I (Planting)-Continued

Map unit symbol and soil name	Pct. of map unit	Suitability for hand planting		Suitability for mechanical planting		Soil rutting hazard	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srr4: Sax-----	5	Moderately suited Wetness	0.50	Moderately suited Wetness	0.50	Severe Low strength Wetness	1.00 0.50
Foglake-----	5	Poorly suited Stickiness; high plasticity index	0.75	Poorly suited Stickiness; high plasticity index	0.75	Severe Low strength	1.00
Bootleg-----	5	Well suited		Well suited		Severe Low strength	1.00
Canthook-----	5	Moderately suited Stickiness; high plasticity index	0.50	Moderately suited Stickiness; high plasticity index	0.50	Moderate Low strength	0.50
2srr7: Mooselake-----	80	Moderately suited Wetness	0.50	Moderately suited Wetness	0.50	Severe Low strength Wetness	1.00 0.50
Tacoosh, moat-----	10	Moderately suited Wetness	0.50	Moderately suited Wetness	0.50	Severe Low strength Wetness	1.00 0.50
Rifle-----	5	Moderately suited Wetness	0.50	Moderately suited Wetness	0.50	Severe Low strength Wetness	1.00 0.50
Cathro, moat-----	5	Moderately suited Wetness	0.50	Moderately suited Wetness	0.50	Severe Low strength Wetness	1.00 0.50
2srr8: Rifle-----	80	Moderately suited Wetness	0.50	Moderately suited Wetness	0.50	Severe Low strength Wetness	1.00 0.50
Tacoosh, moat-----	10	Moderately suited Wetness	0.50	Moderately suited Wetness	0.50	Severe Low strength Wetness	1.00 0.50
Greenwood-----	5	Moderately suited Wetness	0.50	Moderately suited Wetness	0.50	Severe Low strength Wetness	1.00 0.50
Aquepts, stony, moderately slow Ksat-----	5	Well suited		Well suited		Severe Low strength	1.00
2srr9: Tacoosh, frequently flooded-----	40	Moderately suited Wetness	0.50	Poorly suited Wetness	0.75	Severe Low strength Wetness	1.00 0.50
Sax, frequently flooded-----	35	Moderately suited Wetness	0.50	Poorly suited Wetness	0.75	Severe Low strength Wetness	1.00 0.50

# Soil Survey of Voyageurs National Park, Minnesota

Table 9.-Land Management, Part I (Planting)-Continued

Map unit symbol and soil name	Pct. of map unit	Suitability for hand planting		Suitability for mechanical planting		Soil rutting hazard	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srr9: Cathro, frequently flooded-----	10	Moderately suited Wetness	0.50	Poorly suited Wetness	0.75	Severe Low strength Wetness	1.00 0.50
Rifle, frequently flooded-----	10	Moderately suited Wetness	0.50	Poorly suited Wetness	0.75	Severe Low strength Wetness	1.00 0.50
Hassman, frequently flooded-----	5	Moderately suited Stickiness; high plasticity index Wetness	0.50 0.50	Poorly suited Wetness Stickiness; high plasticity index	0.75 0.50	Severe Low strength Wetness	1.00 0.50
2srrb: Aguents, ponded-----	30	Moderately suited Wetness	0.50	Poorly suited Wetness	0.75	Severe Low strength Wetness	1.00 0.50
Sax, ponded-----	25	Moderately suited Wetness	0.50	Moderately suited Wetness	0.50	Severe Low strength Wetness	1.00 0.50
Tacoosh, ponded-----	25	Moderately suited Wetness	0.50	Moderately suited Wetness	0.50	Severe Low strength Wetness	1.00 0.50
Rifle, ponded-----	10	Moderately suited Wetness	0.50	Moderately suited Wetness	0.50	Severe Low strength Wetness	1.00 0.50
Hassman, ponded-----	10	Moderately suited Stickiness; high plasticity index	0.50	Moderately suited Stickiness; high plasticity index	0.50	Severe Low strength	1.00
2srrh: Greenwood, seasonally ponded--	80	Moderately suited Wetness	0.50	Moderately suited Wetness	0.50	Severe Low strength Wetness	1.00 0.50
Merwin, seasonally ponded-----	10	Moderately suited Wetness	0.50	Moderately suited Wetness	0.50	Severe Low strength Wetness	1.00 0.50
Rifle, seasonally ponded-----	5	Moderately suited Wetness	0.50	Moderately suited Wetness	0.50	Severe Low strength Wetness	1.00 0.50
Tacoosh, seasonally ponded-----	5	Moderately suited Wetness	0.50	Moderately suited Wetness	0.50	Severe Low strength Wetness	1.00 0.50



# Soil Survey of Voyageurs National Park, Minnesota

Table 9.--Land Management, Part I (Planting)--Continued

Map unit symbol and soil name	Pct. of map unit	Suitability for hand planting		Suitability for mechanical planting		Soil rutting hazard	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srrj: Rifle, seasonally ponded-----	80	Moderately suited Wetness	0.50	Moderately suited Wetness	0.50	Severe Low strength Wetness	1.00 0.50
Tacoosh, seasonally ponded-----	10	Moderately suited Wetness	0.50	Moderately suited Wetness	0.50	Severe Low strength Wetness	1.00 0.50
Greenwood, seasonally ponded--	5	Moderately suited Wetness	0.50	Moderately suited Wetness	0.50	Severe Low strength Wetness	1.00 0.50
Aquepts, stony, moderately slow Ksat-----	5	Well suited		Well suited		Severe Low strength	1.00
2srrk: Insula, very stony, skeletal-----	30	Moderately suited Rock fragments	0.50	Unsuited Rock fragments Slope	1.00 0.75	Moderate Low strength	0.50
Conic, very stony, skeletal-----	16	Moderately suited Rock fragments	0.50	Poorly suited Rock fragments Slope	0.75 0.50	Slight Strength	0.10
Wahlsten, very stony	15	Moderately suited Rock fragments	0.50	Poorly suited Rock fragments	0.75	Slight Strength	0.10
Quetico, very stony, skeletal----	10	Unsuited Restrictive layer Rock fragments	1.00 0.50	Unsuited Restrictive layer Rock fragments Slope	1.00 0.75 0.75	Slight Strength	0.10
Metonga, very stony, skeletal----	9	Moderately suited Rock fragments	0.50	Poorly suited Rock fragments Slope	0.75 0.50	Slight Strength	0.10
Dishno, very stony, skeletal-----	9	Moderately suited Rock fragments	0.50	Poorly suited Rock fragments Slope	0.75 0.50	Slight Strength	0.10
Aquepts, very rubbly	3	Unsuited Rock fragments	1.00	Unsuited Rock fragments	1.00	Slight Strength	0.10
Aquepts, stony, moderately slow Ksat-----	2	Well suited		Well suited		Severe Low strength	1.00

# Soil Survey of Voyageurs National Park, Minnesota

Table 9.-Land Management, Part I (Planting)-Continued

Map unit symbol and soil name	Pct. of map unit	Suitability for hand planting		Suitability for mechanical planting		Soil rutting hazard	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srrk: Voyageurs-----	2	Moderately suited Stickiness; high plasticity index	0.50	Moderately suited Stickiness; high plasticity index	0.50	Severe Low strength	1.00
Rock outcrop-----	2	Not rated		Not rated		Not rated	
Foglake-----	1	Poorly suited Stickiness; high plasticity index	0.75	Poorly suited Stickiness; high plasticity index	0.75	Severe Low strength	1.00
Eaglesnest, very stony-----	1	Well suited		Moderately suited Rock fragments Slope	0.50 0.50	Slight Strength	0.10
2srrl: Tacoosh, occasionally flooded-----	40	Moderately suited Wetness	0.50	Moderately suited Wetness	0.50	Severe Low strength Wetness	1.00 0.50
Sax, occasionally flooded-----	35	Moderately suited Wetness	0.50	Moderately suited Wetness	0.50	Severe Low strength Wetness	1.00 0.50
Cathro, occasionally flooded-----	10	Moderately suited Wetness	0.50	Moderately suited Wetness	0.50	Severe Low strength Wetness	1.00 0.50
Rifle, occasionally flooded-----	10	Moderately suited Wetness	0.50	Moderately suited Wetness	0.50	Severe Low strength Wetness	1.00 0.50
Hassman, occasionally flooded-----	5	Moderately suited Stickiness; high plasticity index Wetness	0.50 0.50	Moderately suited Stickiness; high plasticity index Wetness	0.50 0.50	Severe Low strength Wetness	1.00 0.50
2srrm: Brickton-----	40	Moderately suited Stickiness; high plasticity index	0.50	Moderately suited Stickiness; high plasticity index	0.50	Severe Low strength	1.00
Hassman-----	35	Moderately suited Stickiness; high plasticity index	0.50	Moderately suited Stickiness; high plasticity index	0.50	Severe Low strength	1.00
Spooner, till/bedrock substratum-----	5	Well suited		Well suited		Severe Low strength	1.00

# Soil Survey of Voyageurs National Park, Minnesota

Table 9.-Land Management, Part I (Planting)-Continued

Map unit symbol and soil name	Pct. of map unit	Suitability for hand planting		Suitability for mechanical planting		Soil rutting hazard	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srrm: Foglake-----	5	Poorly suited Stickiness; high plasticity index	0.75	Poorly suited Stickiness; high plasticity index	0.75	Severe Low strength	1.00
Dalbo-----	5	Well suited		Well suited		Severe Low strength	1.00
Bootleg-----	5	Well suited		Well suited		Severe Low strength	1.00
Tacoosh-----	5	Moderately suited Wetness	0.50	Moderately suited Wetness	0.50	Severe Low strength Wetness	1.00 0.50
2srrn: Brickton-----	60	Moderately suited Stickiness; high plasticity index	0.50	Moderately suited Stickiness; high plasticity index	0.50	Severe Low strength	1.00
Dalbo-----	15	Well suited		Well suited		Severe Low strength	1.00
Voyageurs-----	5	Moderately suited Stickiness; high plasticity index	0.50	Moderately suited Stickiness; high plasticity index	0.50	Severe Low strength	1.00
Foglake-----	5	Poorly suited Stickiness; high plasticity index	0.75	Poorly suited Stickiness; high plasticity index	0.75	Severe Low strength	1.00
Spooner, till/bedrock substratum-----	5	Well suited		Well suited		Severe Low strength	1.00
Bootleg-----	5	Well suited		Well suited		Severe Low strength	1.00
Hassman-----	5	Moderately suited Stickiness; high plasticity index	0.50	Moderately suited Stickiness; high plasticity index	0.50	Severe Low strength	1.00
2srrq: Cathro, ponded-----	60	Moderately suited Wetness	0.50	Moderately suited Wetness	0.50	Severe Low strength Wetness	1.00 0.50
Tacoosh, ponded-----	30	Moderately suited Wetness	0.50	Moderately suited Wetness	0.50	Severe Low strength Wetness	1.00 0.50
Sax, ponded-----	5	Moderately suited Wetness	0.50	Moderately suited Wetness	0.50	Severe Low strength Wetness	1.00 0.50
Aquepts, stony, moderately slow Ksat-----	5	Well suited		Well suited		Severe Low strength	1.00

# Soil Survey of Voyageurs National Park, Minnesota

Table 9.-Land Management, Part I (Planting)-Continued

Map unit symbol and soil name	Pct. of map unit	Suitability for hand planting		Suitability for mechanical planting		Soil rutting hazard	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srrr: Insula, very stony, skeletal-----	30	Moderately suited Rock fragments	0.50	Unsuited Rock fragments Slope	1.00 0.50	Moderate Low strength	0.50
Voyageurs-----	20	Moderately suited Stickiness; high plasticity index	0.50	Moderately suited Stickiness; high plasticity index	0.50	Severe Low strength	1.00
Wahlsten, very stony	15	Moderately suited Rock fragments	0.50	Poorly suited Rock fragments	0.75	Slight Strength	0.10
Conic, very stony, skeletal-----	10	Moderately suited Rock fragments	0.50	Poorly suited Rock fragments Slope	0.75 0.50	Slight Strength	0.10
Spooner, till/bedrock substratum-----	8	Well suited		Well suited		Severe Low strength	1.00
Brickton-----	5	Moderately suited Stickiness; high plasticity index	0.50	Moderately suited Stickiness; high plasticity index	0.50	Severe Low strength	1.00
Dishno, very stony, skeletal-----	5	Moderately suited Rock fragments	0.50	Poorly suited Rock fragments Slope	0.75 0.50	Slight Strength	0.10
Aquepts, very rubbly	3	Unsuited Rock fragments	1.00	Unsuited Rock fragments	1.00	Slight Strength	0.10
Aquepts, stony, moderately slow Ksat-----	2	Well suited		Well suited		Severe Low strength	1.00
Rock outcrop-----	2	Not rated		Not rated		Not rated	
2srtr: Bowstring, frequently flooded	50	Moderately suited Wetness	0.50	Moderately suited Wetness	0.50	Severe Low strength Wetness	1.00 0.50
Fluvaquents, frequently flooded	40	Moderately suited Wetness	0.50	Moderately suited Wetness	0.50	Severe Low strength Wetness	1.00 0.50
Cathro, frequently flooded-----	10	Moderately suited Wetness	0.50	Moderately suited Wetness	0.50	Severe Low strength Wetness	1.00 0.50
W: Water-----	100	Not rated		Not rated		Not rated	

# Soil Survey of Voyageurs National Park, Minnesota

Table 9.—Land Management, Part II (Hazard of Erosion and Suitability for Roads)

(Onsite investigation may be needed to validate the interpretations in this table and to confirm the identity of the soil on a given site. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table)

Map unit symbol and soil name	Pct. of map unit	Hazard of erosion		Hazard of erosion on roads and trails		Suitability for roads (natural surface)	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srmd: Quetico, bouldery---	35	Slight		Severe Slope/erodibility	0.95	Moderately suited Slope	0.50
Insula, bouldery----	20	Slight		Severe Slope/erodibility	0.95	Moderately suited Slope	0.50
Rock outcrop-----	15	Not rated		Not rated		Not rated	
Wahlsten, bouldery, skeletal-----	10	Slight		Slight		Well suited	
Conic, bouldery, skeletal-----	10	Slight		Moderate Slope/erodibility	0.50	Moderately suited Slope	0.50
Arcadian, very stony	10	Moderate Slope/erodibility	0.50	Moderate Slope/erodibility	0.50	Poorly suited Slope Rock fragments	1.00 0.50
2srqm: Quetico, bouldery---	40	Moderate Slope/erodibility	0.50	Severe Slope/erodibility	0.95	Poorly suited Slope	1.00
Insula, bouldery----	25	Moderate Slope/erodibility	0.50	Severe Slope/erodibility	0.95	Poorly suited Slope	1.00
Rock outcrop-----	15	Not rated		Not rated		Not rated	
Conic, bouldery, skeletal-----	10	Slight		Moderate Slope/erodibility	0.50	Moderately suited Slope	0.50
Arcadian, very stony	10	Moderate Slope/erodibility	0.50	Severe Slope/erodibility	0.95	Poorly suited Slope Rock fragments	1.00 0.50
2srqn: Insula, very bouldery, skeletal	35	Moderate Slope/erodibility	0.50	Severe Slope/erodibility	0.95	Poorly suited Low strength Slope Rock fragments	1.00 1.00 0.50
Conic, very bouldery, skeletal	16	Moderate Slope/erodibility	0.50	Moderate Slope/erodibility	0.50	Poorly suited Slope Rock fragments	1.00 0.50
Rock outcrop-----	15	Not rated		Not rated		Not rated	
Metonga, very stony, skeletal----	14	Slight		Moderate Slope/erodibility	0.50	Moderately suited Rock fragments Slope	0.50 0.50



# Soil Survey of Voyageurs National Park, Minnesota

Table 9.—Land Management, Part II (Hazard of Erosion and Suitability for Roads)—Continued

Map unit symbol and soil name	Pct. of map unit	Hazard of erosion		Hazard of erosion on roads and trails		Suitability for roads (natural surface)	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srqn: Quetico, very bouldery, skeletal	10	Moderate Slope/erodibility	0.50	Severe Slope/erodibility	0.95	Poorly suited Slope Rock fragments	1.00 0.50
Wahlsten, very stony	5	Slight		Slight		Moderately suited Rock fragments	0.50
Voyageurs-----	3	Slight		Slight		Moderately suited Low strength	0.50
Aquepts, very rubbly	2	Slight		Slight		Poorly suited Wetness Rock fragments Ponding	1.00 1.00 0.50
2srqp: Quetico, very bouldery, skeletal	31	Slight		Moderate Slope/erodibility	0.50	Moderately suited Rock fragments Slope	0.50 0.50
Insula, very bouldery, skeletal	30	Slight		Moderate Slope/erodibility	0.50	Poorly suited Low strength Rock fragments Slope	1.00 0.50 0.50
Greenwood-----	15	Slight		Slight		Poorly suited Low strength Wetness	1.00 1.00
Rock outcrop-----	9	Not rated		Not rated		Not rated	
Merwin-----	5	Slight		Slight		Poorly suited Low strength Wetness	1.00 1.00
Aquepts, very rubbly	5	Slight		Slight		Poorly suited Wetness Rock fragments Ponding	1.00 1.00 0.50
Wahlsten, very stony	3	Slight		Slight		Moderately suited Rock fragments	0.50
Conic, very bouldery, skeletal	2	Slight		Moderate Slope/erodibility	0.50	Moderately suited Rock fragments Slope	0.50 0.50
2srqr: Greenwood-----	80	Slight		Slight		Poorly suited Low strength Wetness	1.00 1.00
Merwin-----	10	Slight		Slight		Poorly suited Low strength Wetness	1.00 1.00

# Soil Survey of Voyageurs National Park, Minnesota

Table 9.—Land Management, Part II (Hazard of Erosion and Suitability for Roads)—Continued

Map unit symbol and soil name	Pct. of map unit	Hazard of erosion		Hazard of erosion on roads and trails		Suitability for roads (natural surface)	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srqr: Rifle, moat-----	5	Slight		Slight		Poorly suited Low strength Wetness Ponding	1.00 1.00 0.50
Tacoosh, moat-----	5	Slight		Slight		Poorly suited Low strength Wetness Ponding	1.00 1.00 0.50
2srqs: Insula, very stony, skeletal-----	30	Slight		Moderate Slope/erodibility	0.50	Poorly suited Low strength Rock fragments Slope	1.00 0.50 0.50
Conic, very stony, skeletal-----	16	Slight		Moderate Slope/erodibility	0.50	Moderately suited Rock fragments Slope	0.50 0.50
Wahlsten, very stony	15	Slight		Slight		Moderately suited Rock fragments	0.50
Quetico, very stony, skeletal----	10	Slight		Moderate Slope/erodibility	0.50	Moderately suited Rock fragments Slope	0.50 0.50
Metonga, very stony, skeletal----	9	Slight		Moderate Slope/erodibility	0.50	Moderately suited Rock fragments Slope	0.50 0.50
Dishno, very stony, skeletal-----	9	Slight		Moderate Slope/erodibility	0.50	Moderately suited Rock fragments	0.50
Aquepts, very rubbly	3	Slight		Slight		Poorly suited Wetness Rock fragments Ponding	1.00 1.00 0.50
Aquepts, stony, moderately slow Ksat-----	2	Slight		Slight		Poorly suited Low strength Ponding Wetness	1.00 1.00 1.00
Voyageurs-----	2	Slight		Slight		Moderately suited Low strength	0.50
Rock outcrop-----	2	Not rated		Not rated		Not rated	
Foglake-----	1	Slight		Slight		Poorly suited Low strength Wetness	1.00 0.50

# Soil Survey of Voyageurs National Park, Minnesota

Table 9.—Land Management, Part II (Hazard of Erosion and Suitability for Roads)—Continued

Map unit symbol and soil name	Pct. of map unit	Hazard of erosion		Hazard of erosion on roads and trails		Suitability for roads (natural surface)	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srqs: Eaglesnest, very stony-----	1	Slight		Slight		Moderately suited Rock fragments Slope	0.50 0.50
2srqv: Voyageurs, oxyaquic	35	Slight		Slight		Moderately suited Low strength	0.50
Conic, very stony, skeletal-----	15	Slight		Moderate Slope/erodibility	0.50	Moderately suited Rock fragments Slope	0.50 0.50
Littleswan-----	20	Slight		Slight		Moderately suited Low strength	0.50
Insula, very stony, skeletal-----	10	Slight		Moderate Slope/erodibility	0.50	Poorly suited Low strength Rock fragments Slope	1.00 0.50 0.50
Wahlsten, very stony	5	Slight		Slight		Moderately suited Rock fragments	0.50
Metonga, very stony, skeletal----	5	Slight		Moderate Slope/erodibility	0.50	Moderately suited Rock fragments Slope	0.50 0.50
Baudette-----	5	Slight		Moderate Slope/erodibility	0.50	Moderately suited Low strength	0.50
Aquepts, stony, moderately slow Ksat-----	4	Slight		Slight		Poorly suited Low strength Ponding Wetness	1.00 1.00 1.00
Rock outcrop-----	1	Not rated		Not rated		Not rated	
2srqw: Wahlsten, very stony	26	Slight		Slight		Moderately suited Rock fragments	0.50
Spooner-----	24	Slight		Slight		Poorly suited Low strength Wetness	1.00 0.50
Voyageurs-----	22	Slight		Moderate Slope/erodibility	0.50	Moderately suited Low strength	0.50
Insula, very stony, skeletal-----	10	Slight		Moderate Slope/erodibility	0.50	Poorly suited Low strength Rock fragments	1.00 0.50

# Soil Survey of Voyageurs National Park, Minnesota

Table 9.—Land Management, Part II (Hazard of Erosion and Suitability for Roads)—Continued

Map unit symbol and soil name	Pct. of map unit	Hazard of erosion		Hazard of erosion on roads and trails		Suitability for roads (natural surface)	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srqw: Dishno, very stony, skeletal-----	9	Slight		Moderate Slope/erodibility	0.50	Moderately suited Rock fragments	0.50
Aquepts, stony, moderately slow Ksat-----	3	Slight		Slight		Poorly suited Low strength Ponding Wetness	1.00 1.00 1.00
Littleswan-----	3	Slight		Slight		Moderately suited Low strength	0.50
Aquepts, very rubbly	2	Slight		Slight		Poorly suited Wetness Rock fragments Ponding	1.00 1.00 0.50
Rock outcrop-----	1	Not rated		Not rated		Not rated	
2srqy: Baudette-----	40	Slight		Moderate Slope/erodibility	0.50	Moderately suited Low strength	0.50
Littleswan-----	35	Slight		Slight		Moderately suited Low strength	0.50
Voyageurs-----	10	Slight		Moderate Slope/erodibility	0.50	Moderately suited Low strength	0.50
Wahlsten, very stony	5	Slight		Slight		Moderately suited Rock fragments	0.50
Insula, very stony, skeletal-----	5	Slight		Moderate Slope/erodibility	0.50	Poorly suited Low strength Rock fragments Slope	1.00 0.50 0.50
Spooner-----	5	Slight		Slight		Poorly suited Low strength Wetness	1.00 0.50
2srqz: Canthook-----	30	Slight		Moderate Slope/erodibility	0.50	Poorly suited Wetness	1.00
Durkeelake-----	30	Slight		Moderate Slope/erodibility	0.50	Moderately suited Wetness Slope	0.50 0.50
Bootleg-----	10	Slight		Slight		Poorly suited Low strength Wetness	1.00 1.00
Udipsamments-----	10	Slight		Moderate Slope/erodibility	0.50	Moderately suited Sandiness Slope	0.50 0.50

# Soil Survey of Voyageurs National Park, Minnesota

Table 9.—Land Management, Part II (Hazard of Erosion and Suitability for Roads)—Continued

Map unit symbol and soil name	Pct. of map unit	Hazard of erosion		Hazard of erosion on roads and trails		Suitability for roads (natural surface)	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srqz: Grytal-----	10	Slight		Slight		Well suited	
Voyageurs-----	5	Slight		Moderate Slope/erodibility	0.50	Moderately suited Low strength	0.50
Aquepts, stony, moderately slow Ksat-----	5	Slight		Slight		Poorly suited Low strength Ponding Wetness	1.00 1.00 1.00
2srr3: Spooners-----	40	Slight		Slight		Poorly suited Low strength Wetness	1.00 0.50
Sax-----	35	Slight		Slight		Poorly suited Low strength Ponding	1.00 1.00
Spooners, till/bedrock substratum-----	5	Slight		Slight		Moderately suited Low strength Wetness	0.50 0.50
Foglake-----	5	Slight		Slight		Poorly suited Low strength Wetness	1.00 0.50
Little Swan-----	5	Slight		Slight		Moderately suited Low strength	0.50
Bootleg-----	5	Slight		Slight		Poorly suited Low strength Wetness	1.00 1.00
Canthook-----	5	Slight		Slight		Poorly suited Wetness	1.00
2srr4: Little Swan-----	40	Slight		Slight		Moderately suited Low strength	0.50
Spooners-----	25	Slight		Slight		Poorly suited Low strength Wetness	1.00 0.50
Voyageurs-----	10	Slight		Moderate Slope/erodibility	0.50	Moderately suited Low strength	0.50
Spooners, till/bedrock substratum-----	5	Slight		Slight		Moderately suited Low strength Wetness	0.50 0.50



# Soil Survey of Voyageurs National Park, Minnesota

Table 9.—Land Management, Part II (Hazard of Erosion and Suitability for Roads)—Continued

Map unit symbol and soil name	Pct. of map unit	Hazard of erosion		Hazard of erosion on roads and trails		Suitability for roads (natural surface)	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srr4: Sax-----	5	Slight		Slight		Poorly suited Low strength Ponding	1.00 1.00
Foglake-----	5	Slight		Slight		Poorly suited Low strength Wetness	1.00 0.50
Bootleg-----	5	Slight		Slight		Poorly suited Low strength Wetness	1.00 1.00
Canthook-----	5	Slight		Slight		Poorly suited Wetness	1.00
2srr7: Mooselake-----	80	Slight		Slight		Poorly suited Low strength Wetness Ponding	1.00 1.00 0.50
Tacoosh, moat-----	10	Slight		Slight		Poorly suited Low strength Ponding Wetness	1.00 1.00 1.00
Rifle-----	5	Slight		Slight		Poorly suited Low strength Wetness	1.00 1.00
Cathro, moat-----	5	Slight		Slight		Poorly suited Low strength Ponding Wetness	1.00 1.00 1.00
2srr8: Rifle-----	80	Slight		Slight		Poorly suited Low strength Wetness	1.00 1.00
Tacoosh, moat-----	10	Slight		Slight		Poorly suited Low strength Ponding Wetness	1.00 1.00 1.00
Greenwood-----	5	Slight		Slight		Poorly suited Low strength Wetness	1.00 1.00
2srr9: Tacoosh, frequently flooded-----	40	Slight		Slight		Poorly suited Low strength Flooding Wetness	1.00 1.00 1.00
Sax, frequently flooded-----	35	Slight		Slight		Poorly suited Low strength Flooding	1.00 1.00

# Soil Survey of Voyageurs National Park, Minnesota

Table 9.—Land Management, Part II (Hazard of Erosion and Suitability for Roads)—Continued

Map unit symbol and soil name	Pct. of map unit	Hazard of erosion		Hazard of erosion on roads and trails		Suitability for roads (natural surface)	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srr9: Cathro, frequently flooded-----	10	Slight		Slight		Poorly suited Low strength Flooding Wetness	1.00 1.00 1.00
Rifle, frequently flooded-----	10	Slight		Slight		Poorly suited Low strength Flooding Wetness	1.00 1.00 1.00
Hassman, frequently flooded-----	5	Slight		Slight		Poorly suited Low strength Flooding Wetness	1.00 1.00 1.00
2srrb: Aguents, ponded-----	30	Slight		Slight		Poorly suited Ponding Low strength	1.00 0.50
Sax, ponded-----	25	Slight		Slight		Poorly suited Low strength Ponding	1.00 1.00
Tacoosh, ponded-----	25	Slight		Slight		Poorly suited Low strength Ponding Wetness	1.00 1.00 1.00
Rifle, ponded-----	10	Slight		Slight		Poorly suited Low strength Ponding Wetness	1.00 1.00 1.00
Hassman, ponded-----	10	Slight		Slight		Poorly suited Low strength Ponding Wetness	1.00 1.00 1.00
2srrh: Greenwood, seasonally ponded--	80	Slight		Slight		Poorly suited Low strength Ponding Wetness	1.00 1.00 1.00
Merwin, seasonally ponded-----	10	Slight		Slight		Poorly suited Low strength Ponding Wetness	1.00 1.00 1.00
Rifle, seasonally ponded-----	5	Slight		Slight		Poorly suited Low strength Ponding Wetness	1.00 1.00 1.00

# Soil Survey of Voyageurs National Park, Minnesota

Table 9.—Land Management, Part II (Hazard of Erosion and Suitability for Roads)—Continued

Map unit symbol and soil name	Pct. of map unit	Hazard of erosion		Hazard of erosion on roads and trails		Suitability for roads (natural surface)	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srrh: Tacoosh, seasonally ponded-----	5	Slight		Slight		Poorly suited Low strength Ponding Wetness	1.00 1.00 1.00
2srrj: Rifle, seasonally ponded-----	80	Slight		Slight		Poorly suited Low strength Ponding Wetness	1.00 1.00 1.00
Tacoosh, seasonally ponded-----	10	Slight		Slight		Poorly suited Low strength Ponding Wetness	1.00 1.00 1.00
Greenwood, seasonally ponded--	5	Slight		Slight		Poorly suited Low strength Ponding Wetness	1.00 1.00 1.00
Aquepts, stony, moderately slow Ksat-----	5	Slight		Slight		Poorly suited Low strength Ponding Wetness	1.00 1.00 1.00
2srrk: Insula, very stony, skeletal-----	30	Moderate Slope/erodibility	0.50	Severe Slope/erodibility	0.95	Poorly suited Low strength Slope Rock fragments	1.00 1.00 0.50
Conic, very stony, skeletal-----	16	Slight		Moderate Slope/erodibility	0.50	Moderately suited Slope Rock fragments	0.50 0.50
Wahlsten, very stony	15	Slight		Slight		Moderately suited Rock fragments	0.50
Quetico, very stony, skeletal----	10	Moderate Slope/erodibility	0.50	Severe Slope/erodibility	0.95	Poorly suited Slope Rock fragments	1.00 0.50
Metonga, very stony, skeletal----	9	Slight		Moderate Slope/erodibility	0.50	Moderately suited Rock fragments Slope	0.50 0.50
Dishno, very stony, skeletal-----	9	Slight		Moderate Slope/erodibility	0.50	Moderately suited Rock fragments	0.50

# Soil Survey of Voyageurs National Park, Minnesota

Table 9.—Land Management, Part II (Hazard of Erosion and Suitability for Roads)—Continued

Map unit symbol and soil name	Pct. of map unit	Hazard of erosion		Hazard of erosion on roads and trails		Suitability for roads (natural surface)	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srrk: Aquepts, very rubbly	3	Slight		Slight		Poorly suited Wetness Rock fragments Ponding	1.00 1.00 0.50
Aquepts, stony, moderately slow Ksat-----	2	Slight		Slight		Poorly suited Low strength Ponding Wetness	1.00 1.00 1.00
Voyageurs-----	2	Slight		Slight		Moderately suited Low strength	0.50
Rock outcrop-----	2	Not rated		Not rated		Not rated	
Foglake-----	1	Slight		Slight		Poorly suited Low strength Wetness	1.00 0.50
Eaglesnest, very stony-----	1	Slight		Moderate Slope/erodibility	0.50	Moderately suited Rock fragments Slope	0.50 0.50
2srri: Tacoosh, occasionally flooded-----	40	Slight		Slight		Poorly suited Low strength Wetness Flooding	1.00 1.00 0.50
Sax, occasionally flooded-----	35	Slight		Slight		Poorly suited Low strength Flooding	1.00 0.50
Cathro, occasionally flooded-----	10	Slight		Slight		Poorly suited Low strength Wetness Flooding	1.00 1.00 0.50
Rifle, occasionally flooded-----	10	Slight		Slight		Poorly suited Low strength Wetness Flooding	1.00 1.00 0.50
Hassman, occasionally flooded-----	5	Slight		Slight		Poorly suited Low strength Wetness Flooding	1.00 1.00 0.50

# Soil Survey of Voyageurs National Park, Minnesota

Table 9.—Land Management, Part II (Hazard of Erosion and Suitability for Roads)—Continued

Map unit symbol and soil name	Pct. of map unit	Hazard of erosion		Hazard of erosion on roads and trails		Suitability for roads (natural surface)	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srrm: Brickton-----	40	Slight		Slight		Poorly suited Low strength	1.00
Hassman-----	35	Slight		Slight		Poorly suited Low strength Ponding Wetness	1.00 1.00 1.00
Spooner, till/bedrock substratum-----	5	Slight		Slight		Moderately suited Low strength Wetness	0.50 0.50
Foglake-----	5	Slight		Slight		Poorly suited Low strength Wetness	1.00 0.50
Dalbo-----	5	Slight		Slight		Moderately suited Low strength Wetness	0.50 0.50
Bootleg-----	5	Slight		Slight		Poorly suited Low strength Wetness	1.00 1.00
Tacoosh-----	5	Slight		Slight		Poorly suited Low strength Ponding Wetness	1.00 1.00 1.00
2srrn: Brickton-----	60	Slight		Slight		Poorly suited Low strength	1.00
Dalbo-----	15	Slight		Moderate Slope/erodibility	0.50	Moderately suited Low strength Wetness	0.50 0.50
Voyageurs-----	5	Slight		Moderate Slope/erodibility	0.50	Moderately suited Low strength	0.50
Foglake-----	5	Slight		Slight		Poorly suited Low strength Wetness	1.00 0.50
Spooner, till/bedrock substratum-----	5	Slight		Slight		Moderately suited Low strength Wetness	0.50 0.50
Bootleg-----	5	Slight		Slight		Poorly suited Low strength Wetness	1.00 1.00
Hassman-----	5	Slight		Slight		Poorly suited Low strength Ponding Wetness	1.00 1.00 1.00



# Soil Survey of Voyageurs National Park, Minnesota

Table 9.—Land Management, Part II (Hazard of Erosion and Suitability for Roads)—Continued

Map unit symbol and soil name	Pct. of map unit	Hazard of erosion		Hazard of erosion on roads and trails		Suitability for roads (natural surface)	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srrq: Cathro, ponded-----	60	Slight		Slight		Poorly suited Low strength Ponding Wetness	1.00 1.00 1.00
Tacoosh, ponded-----	30	Slight		Slight		Poorly suited Low strength Ponding Wetness	1.00 1.00 1.00
Sax, ponded-----	5	Slight		Slight		Poorly suited Low strength Ponding	1.00 1.00
Aquepts, stony, moderately slow Ksat-----	5	Slight		Slight		Poorly suited Low strength Ponding Wetness	1.00 1.00 1.00
2srrr: Insula, very stony, skeletal-----	30	Slight		Moderate Slope/erodibility	0.50	Poorly suited Low strength Rock fragments Slope	1.00 0.50 0.50
Voyageurs-----	20	Slight		Moderate Slope/erodibility	0.50	Moderately suited Low strength	0.50
Wahlsten, very stony	15	Slight		Slight		Moderately suited Rock fragments	0.50
Conic, very stony, skeletal-----	10	Slight		Moderate Slope/erodibility	0.50	Moderately suited Rock fragments Slope	0.50 0.50
Spooner, till/bedrock substratum-----	8	Slight		Slight		Moderately suited Low strength Wetness	0.50 0.50
Brickton-----	5	Slight		Slight		Poorly suited Low strength	1.00
Dishno, very stony, skeletal-----	5	Slight		Moderate Slope/erodibility	0.50	Moderately suited Rock fragments	0.50
Aquepts, very rubbly	3	Slight		Slight		Poorly suited Wetness Rock fragments Ponding	1.00 1.00 0.50

# Soil Survey of Voyageurs National Park, Minnesota

Table 9.—Land Management, Part II (Hazard of Erosion and Suitability for Roads)—Continued

Map unit symbol and soil name	Pct. of map unit	Hazard of erosion		Hazard of erosion on roads and trails		Suitability for roads (natural surface)	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srrr: Aquepts, stony, moderately slow Ksat-----	2	Slight		Slight		Poorly suited Low strength Ponding Wetness	1.00 1.00 1.00
Rock outcrop-----	2	Not rated		Not rated		Not rated	
2srtr: Bowstring, frequently flooded	50	Slight		Slight		Poorly suited Low strength Flooding Wetness	1.00 1.00 1.00
Fluvaquents, frequently flooded	40	Slight		Slight		Poorly suited Low strength Flooding	1.00 1.00
Cathro, frequently flooded-----	10	Slight		Slight		Poorly suited Low strength Flooding Wetness	1.00 1.00 1.00
W. Water							

# Soil Survey of Voyageurs National Park, Minnesota

Table 9.—Land Management, Part III (Site Preparation)

(Onsite investigation may be needed to validate the interpretations in this table and to confirm the identity of the soil on a given site. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the mitigation. See text for further explanation of ratings in this table)

Map unit symbol and soil name	Pct. of map unit	Suitability for mechanical site preparation (deep)		Suitability for mechanical site preparation (surface)	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srmd: Quetico, bouldery---	35	Unsuited Restrictive layer	1.00	Unsuited Restrictive layer	1.00
Insula, bouldery----	20	Unsuited Restrictive layer	1.00	Unsuited Restrictive layer	1.00
Rock outcrop-----	15	Not rated		Not rated	
Wahlsten, bouldery, skeletal-----	10	Poorly suited Restrictive layer	0.50	Poorly suited Rock fragments	0.50
Conic, bouldery, skeletal-----	10	Poorly suited Restrictive layer	0.50	Poorly suited Rock fragments	0.50
Arcadian, very stony	10	Unsuited Restrictive layer Slope	1.00 0.50	Poorly suited Rock fragments Slope	0.50 0.50
2srqm: Quetico, bouldery---	40	Unsuited Restrictive layer Slope	1.00 0.50	Unsuited Restrictive layer Slope	1.00 0.50
Insula, bouldery----	25	Unsuited Restrictive layer Slope	1.00 0.50	Unsuited Restrictive layer Slope	1.00 0.50
Rock outcrop-----	15	Not rated		Not rated	
Conic, bouldery, skeletal-----	10	Poorly suited Restrictive layer	0.50	Poorly suited Rock fragments	0.50
Arcadian, very stony	10	Unsuited Restrictive layer Slope	1.00 0.50	Poorly suited Rock fragments Slope	0.50 0.50
2srqn: Insula, very bouldery, skeletal	35	Unsuited Restrictive layer Slope Rock fragments	1.00 0.50 0.50	Poorly suited Rock fragments Slope	0.50 0.50
Conic, very bouldery, skeletal	16	Poorly suited Slope Restrictive layer	0.50 0.50	Poorly suited Rock fragments Slope	0.50 0.50
Rock outcrop-----	15	Not rated		Not rated	

# Soil Survey of Voyageurs National Park, Minnesota

Table 9.—Land Management, Part III (Site Preparation)—Continued

Map unit symbol and soil name	Pct. of map unit	Suitability for mechanical site preparation (deep)		Suitability for mechanical site preparation (surface)	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srqn: Metonga, very stony, skeletal----	14	Poorly suited Restrictive layer	0.50	Poorly suited Rock fragments	0.50
Quetico, very bouldery, skeletal	10	Unsuited Restrictive layer Slope	1.00 0.50	Unsuited Restrictive layer Rock fragments Slope	1.00 0.50 0.50
Wahlsten, very stony	5	Poorly suited Restrictive layer	0.50	Poorly suited Rock fragments	0.50
Voyageurs-----	3	Well suited		Well suited	
Aquepts, very rubbly	2	Unsuited Wetness Rock fragments	1.00 1.00	Unsuited Rock fragments	1.00
2srqp: Quetico, very bouldery, skeletal	31	Unsuited Restrictive layer	1.00	Unsuited Restrictive layer Rock fragments	1.00 0.50
Insula, very bouldery, skeletal	30	Unsuited Restrictive layer Rock fragments	1.00 0.50	Poorly suited Rock fragments	0.50
Greenwood-----	15	Unsuited Wetness	1.00	Poorly suited Wetness	0.50
Rock outcrop-----	9	Not rated		Not rated	
Merwin-----	5	Unsuited Wetness	1.00	Poorly suited Wetness	0.50
Aquepts, very rubbly	5	Unsuited Wetness Rock fragments	1.00 1.00	Unsuited Rock fragments	1.00
Wahlsten, very stony	3	Poorly suited Restrictive layer	0.50	Poorly suited Rock fragments	0.50
Conic, very bouldery, skeletal	2	Poorly suited Restrictive layer	0.50	Poorly suited Rock fragments	0.50
2srqr: Greenwood-----	80	Unsuited Wetness	1.00	Poorly suited Wetness	0.50
Merwin-----	10	Unsuited Wetness	1.00	Poorly suited Wetness	0.50
Rifle, moat-----	5	Unsuited Wetness	1.00	Poorly suited Wetness	0.50
Tacoosh, moat-----	5	Unsuited Wetness	1.00	Poorly suited Wetness	0.50

# Soil Survey of Voyageurs National Park, Minnesota

Table 9.—Land Management, Part III (Site Preparation)—Continued

Map unit symbol and soil name	Pct. of map unit	Suitability for mechanical site preparation (deep)		Suitability for mechanical site preparation (surface)	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srqs: Insula, very stony, skeletal-----	30	Unsuited Restrictive layer Rock fragments	1.00 0.50	Poorly suited Rock fragments	0.50
Conic, very stony, skeletal-----	16	Poorly suited Restrictive layer	0.50	Poorly suited Rock fragments	0.50
Wahlsten, very stony	15	Poorly suited Restrictive layer	0.50	Poorly suited Rock fragments	0.50
Quetico, very stony, skeletal----	10	Unsuited Restrictive layer	1.00	Unsuited Restrictive layer Rock fragments	1.00 0.50
Metonga, very stony, skeletal----	9	Poorly suited Restrictive layer	0.50	Poorly suited Rock fragments	0.50
Dishno, very stony, skeletal-----	9	Well suited		Poorly suited Rock fragments	0.50
Aquepts, very rubbly	3	Unsuited Wetness Rock fragments	1.00 1.00	Unsuited Rock fragments	1.00
Aquepts, stony, moderately slow Ksat-----	2	Unsuited Wetness	1.00	Well suited	
Voyageurs-----	2	Well suited		Well suited	
Rock outcrop-----	2	Not rated		Not rated	
Foglake-----	1	Unsuited Wetness	1.00	Poorly suited Stickiness; high plasticity index	0.50
Eaglesnest, very stony-----	1	Well suited		Poorly suited Rock fragments	0.50
2srqv: Voyageurs, oxyaquic	35	Well suited		Well suited	
Conic, very stony, skeletal-----	15	Poorly suited Restrictive layer	0.50	Poorly suited Rock fragments	0.50
Little Swan-----	20	Unsuited Wetness	1.00	Well suited	
Insula, very stony, skeletal-----	10	Unsuited Restrictive layer Rock fragments	1.00 0.50	Poorly suited Rock fragments	0.50



Soil Survey of Voyageurs National Park, Minnesota

Table 9.—Land Management, Part III (Site Preparation)—Continued

Map unit symbol and soil name	Pct. of map unit	Suitability for mechanical site preparation (deep)		Suitability for mechanical site preparation (surface)	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srqv: Wahlsten, very stony	5	Poorly suited Restrictive layer	0.50	Poorly suited Rock fragments	0.50
Metonga, very stony, skeletal----	5	Poorly suited Restrictive layer	0.50	Poorly suited Rock fragments	0.50
Baudette-----	5	Well suited		Well suited	
Aquepts, stony, moderately slow Ksat-----	4	Unsuited Wetness	1.00	Well suited	
Rock outcrop-----	1	Not rated		Not rated	
2srqw: Wahlsten, very stony	26	Poorly suited Restrictive layer	0.50	Poorly suited Rock fragments	0.50
Spooner-----	24	Unsuited Wetness	1.00	Well suited	
Voyageurs-----	22	Well suited		Well suited	
Insula, very stony, skeletal-----	10	Unsuited Restrictive layer Rock fragments	1.00 0.50	Poorly suited Rock fragments	0.50
Dishno, very stony, skeletal-----	9	Well suited		Poorly suited Rock fragments	0.50
Aquepts, stony, moderately slow Ksat-----	3	Unsuited Wetness	1.00	Well suited	
Little Swan-----	3	Unsuited Wetness	1.00	Well suited	
Aquepts, very rubbly	2	Unsuited Wetness Rock fragments	1.00 1.00	Unsuited Rock fragments	1.00
Rock outcrop-----	1	Not rated		Not rated	
2srqy: Baudette-----	40	Well suited		Well suited	
Little Swan-----	35	Unsuited Wetness	1.00	Well suited	
Voyageurs-----	10	Well suited		Well suited	
Wahlsten, very stony	5	Poorly suited Restrictive layer	0.50	Poorly suited Rock fragments	0.50

# Soil Survey of Voyageurs National Park, Minnesota

Table 9.—Land Management, Part III (Site Preparation)—Continued

Map unit symbol and soil name	Pct. of map unit	Suitability for mechanical site preparation (deep)		Suitability for mechanical site preparation (surface)	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srqy: Insula, very stony, skeletal-----	5	Unsuited Restrictive layer Rock fragments	1.00 0.50	Poorly suited Rock fragments	0.50
Spooner-----	5	Unsuited Wetness	1.00	Well suited	
2srqz: Canthook-----	30	Well suited		Well suited	
Durkeelake-----	30	Well suited		Well suited	
Bootleg-----	10	Well suited		Well suited	
Udipsamments-----	10	Well suited		Well suited	
Grytal-----	10	Well suited		Well suited	
Voyageurs-----	5	Well suited		Well suited	
Aquepts, stony, moderately slow Ksat-----	5	Unsuited Wetness	1.00	Well suited	
2srr3: Spoonier-----	40	Unsuited Wetness	1.00	Well suited	
Sax-----	35	Unsuited Wetness	1.00	Poorly suited Wetness	0.50
Spooner, till/bedrock substratum-----	5	Unsuited Wetness	1.00	Well suited	
Foglake-----	5	Unsuited Wetness	1.00	Poorly suited Stickiness; high plasticity index	0.50
Littleswan-----	5	Unsuited Wetness	1.00	Well suited	
Bootleg-----	5	Well suited		Well suited	
Canthook-----	5	Well suited		Well suited	
2srr4: Littleswan-----	40	Unsuited Wetness	1.00	Well suited	
Spooner-----	25	Unsuited Wetness	1.00	Well suited	
Voyageurs-----	10	Well suited		Well suited	

# Soil Survey of Voyageurs National Park, Minnesota

Table 9.—Land Management, Part III (Site Preparation)—Continued

Map unit symbol and soil name	Pct. of map unit	Suitability for mechanical site preparation (deep)		Suitability for mechanical site preparation (surface)	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srr4: Spoonier, till/bedrock substratum-----	5	Unsuited Wetness	1.00	Well suited	
Sax-----	5	Unsuited Wetness	1.00	Poorly suited Wetness	0.50
Foglake-----	5	Unsuited Wetness	1.00	Poorly suited Stickiness; high plasticity index	0.50
Bootleg-----	5	Well suited		Well suited	
Canthook-----	5	Well suited		Well suited	
2srr7: Mooselake-----	80	Unsuited Wetness	1.00	Poorly suited Wetness	0.50
Tacoosh, moat-----	10	Unsuited Wetness	1.00	Poorly suited Wetness	0.50
Rifle-----	5	Unsuited Wetness	1.00	Poorly suited Wetness	0.50
Cathro, moat-----	5	Unsuited Wetness	1.00	Poorly suited Wetness	0.50
2srr8: Rifle-----	80	Unsuited Wetness	1.00	Poorly suited Wetness	0.50
Tacoosh, moat-----	10	Unsuited Wetness	1.00	Poorly suited Wetness	0.50
Greenwood-----	5	Unsuited Wetness	1.00	Poorly suited Wetness	0.50
Aquepts, stony, moderately slow Ksat-----	5	Unsuited Wetness	1.00	Well suited	
2srr9: Tacoosh, frequently flooded-----	40	Unsuited Wetness	1.00	Poorly suited Wetness	0.50
Sax, frequently flooded-----	35	Unsuited Wetness	1.00	Poorly suited Wetness	0.50
Cathro, frequently flooded-----	10	Unsuited Wetness	1.00	Poorly suited Wetness	0.50
Rifle, frequently flooded-----	10	Unsuited Wetness	1.00	Poorly suited Wetness	0.50

# Soil Survey of Voyageurs National Park, Minnesota

Table 9.—Land Management, Part III (Site Preparation)—Continued

Map unit symbol and soil name	Pct. of map unit	Suitability for mechanical site preparation (deep)		Suitability for mechanical site preparation (surface)	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srr9: Hassman, frequently flooded-----	5	Unsuited Wetness	1.00	Poorly suited Wetness	0.50
2srrb: Aquepts, ponded-----	30	Unsuited Wetness	1.00	Poorly suited Wetness	0.50
Sax, ponded-----	25	Unsuited Wetness	1.00	Poorly suited Wetness	0.50
Tacoosh, ponded-----	25	Unsuited Wetness	1.00	Poorly suited Wetness	0.50
Rifle, ponded-----	10	Unsuited Wetness	1.00	Poorly suited Wetness	0.50
Hassman, ponded-----	10	Unsuited Wetness	1.00	Poorly suited Wetness	0.50
2srrh: Greenwood, seasonally ponded--	80	Unsuited Wetness	1.00	Poorly suited Wetness	0.50
Merwin, seasonally ponded-----	10	Unsuited Wetness	1.00	Poorly suited Wetness	0.50
Rifle, seasonally ponded-----	5	Unsuited Wetness	1.00	Poorly suited Wetness	0.50
Tacoosh, seasonally ponded-----	5	Unsuited Wetness	1.00	Poorly suited Wetness	0.50
2srrj: Rifle, seasonally ponded-----	80	Unsuited Wetness	1.00	Poorly suited Wetness	0.50
Tacoosh, seasonally ponded-----	10	Unsuited Wetness	1.00	Poorly suited Wetness	0.50
Greenwood, seasonally ponded--	5	Unsuited Wetness	1.00	Poorly suited Wetness	0.50
Aquepts, stony, moderately slow Ksat-----	5	Unsuited Wetness	1.00	Well suited	

# Soil Survey of Voyageurs National Park, Minnesota

Table 9.—Land Management, Part III (Site Preparation)—Continued

Map unit symbol and soil name	Pct. of map unit	Suitability for mechanical site preparation (deep)		Suitability for mechanical site preparation (surface)	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srrk: Insula, very stony, skeletal-----	30	Unsuited Restrictive layer Slope Rock fragments	1.00 0.50 0.50	Poorly suited Rock fragments Slope	0.50 0.50
Conic, very stony, skeletal-----	16	Poorly suited Restrictive layer	0.50	Poorly suited Rock fragments	0.50
Wahlsten, very stony	15	Poorly suited Restrictive layer	0.50	Poorly suited Rock fragments	0.50
Quetico, very stony, skeletal----	10	Unsuited Restrictive layer Slope	1.00 0.50	Unsuited Restrictive layer Rock fragments Slope	1.00 0.50 0.50
Metonga, very stony, skeletal----	9	Poorly suited Restrictive layer	0.50	Poorly suited Rock fragments	0.50
Dishno, very stony, skeletal-----	9	Well suited		Poorly suited Rock fragments	0.50
Aquepts, very rubbly	3	Unsuited Wetness Rock fragments	1.00 1.00	Unsuited Rock fragments	1.00
Aquepts, stony, moderately slow Ksat-----	2	Unsuited Wetness	1.00	Well suited	
Voyageurs-----	2	Well suited		Well suited	
Rock outcrop-----	2	Not rated		Not rated	
Foglake-----	1	Unsuited Wetness	1.00	Poorly suited Stickiness; high plasticity index	0.50
Eaglesnest, very stony-----	1	Well suited		Poorly suited Rock fragments	0.50
2srrl: Tacoosh, occasionally flooded-----	40	Unsuited Wetness	1.00	Poorly suited Wetness	0.50
Sax, occasionally flooded-----	35	Unsuited Wetness	1.00	Poorly suited Wetness	0.50



# Soil Survey of Voyageurs National Park, Minnesota

Table 9.—Land Management, Part III (Site Preparation)—Continued

Map unit symbol and soil name	Pct. of map unit	Suitability for mechanical site preparation (deep)		Suitability for mechanical site preparation (surface)	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srrl: Cathro, occasionally flooded-----	10	Unsuited Wetness	1.00	Poorly suited Wetness	0.50
Rifle, occasionally flooded-----	10	Unsuited Wetness	1.00	Poorly suited Wetness	0.50
Hassman, occasionally flooded-----	5	Unsuited Wetness	1.00	Poorly suited Wetness	0.50
2srrm: Brickton-----	40	Unsuited Wetness	1.00	Well suited	
Hassman-----	35	Unsuited Wetness	1.00	Poorly suited Wetness	0.50
Spooner, till/bedrock substratum-----	5	Unsuited Wetness	1.00	Well suited	
Foglake-----	5	Unsuited Wetness	1.00	Poorly suited Stickiness; high plasticity index	0.50
Dalbo-----	5	Well suited		Well suited	
Bootleg-----	5	Well suited		Well suited	
Tacoosh-----	5	Unsuited Wetness	1.00	Poorly suited Wetness	0.50
2srrn: Brickton-----	60	Unsuited Wetness	1.00	Well suited	
Dalbo-----	15	Well suited		Well suited	
Voyageurs-----	5	Well suited		Well suited	
Foglake-----	5	Unsuited Wetness	1.00	Poorly suited Stickiness; high plasticity index	0.50
Spooner, till/bedrock substratum-----	5	Unsuited Wetness	1.00	Well suited	
Bootleg-----	5	Well suited		Well suited	
Hassman-----	5	Unsuited Wetness	1.00	Poorly suited Wetness	0.50

# Soil Survey of Voyageurs National Park, Minnesota

Table 9.—Land Management, Part III (Site Preparation)—Continued

Map unit symbol and soil name	Pct. of map unit	Suitability for mechanical site preparation (deep)		Suitability for mechanical site preparation (surface)	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srrq: Cathro, ponded-----	60	Unsuited Wetness	1.00	Poorly suited Wetness	0.50
Tacoosh, ponded-----	30	Unsuited Wetness	1.00	Poorly suited Wetness	0.50
Sax, ponded-----	5	Unsuited Wetness	1.00	Poorly suited Wetness	0.50
Aquepts, stony, moderately slow Ksat-----	5	Unsuited Wetness	1.00	Well suited	
2srrr: Insula, very stony, skeletal-----	30	Unsuited Restrictive layer Rock fragments	1.00 0.50	Poorly suited Rock fragments	0.50
Voyageurs-----	20	Well suited		Well suited	
Wahlsten, very stony	15	Poorly suited Restrictive layer	0.50	Poorly suited Rock fragments	0.50
Conic, very stony, skeletal-----	10	Poorly suited Restrictive layer	0.50	Poorly suited Rock fragments	0.50
Spooner, till/bedrock substratum-----	8	Unsuited Wetness	1.00	Well suited	
Brickton-----	5	Unsuited Wetness	1.00	Well suited	
Dishno, very stony, skeletal-----	5	Well suited		Poorly suited Rock fragments	0.50
Aquepts, very rubbly	3	Unsuited Wetness Rock fragments	1.00 1.00	Unsuited Rock fragments	1.00
Aquepts, stony, moderately slow Ksat-----	2	Unsuited Wetness	1.00	Well suited	
Rock outcrop-----	2	Not rated		Not rated	
2srtr: Bowstring, frequently flooded	50	Unsuited Wetness	1.00	Poorly suited Wetness	0.50

# Soil Survey of Voyageurs National Park, Minnesota

Table 9.—Land Management, Part III (Site Preparation)—Continued

Map unit symbol and soil name	Pct. of map unit	Suitability for mechanical site preparation (deep)		Suitability for mechanical site preparation (surface)	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srst: Fluvaquents, frequently flooded	40	Unsuited Wetness	1.00	Poorly suited Wetness	0.50
Cathro, frequently flooded-----	10	Unsuited Wetness	1.00	Poorly suited Wetness	0.50
W: Water-----	100	Not rated		Not rated	

# Soil Survey of Voyageurs National Park, Minnesota

Table 9.-Land Management, Part IV (Site Restoration)

(Onsite investigation may be needed to validate the interpretations in this table and to confirm the identity of the soil on a given site. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table)

Map unit symbol and soil name	Pct. of map unit	Potential for damage to soil by fire		Potential for seedling mortality	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srmd:					
Quetico, bouldery----	35	Low		Low	
Insula, bouldery----	20	Low		Low	
Rock outcrop-----	15	Not rated		Not rated	
Wahlsten, bouldery, skeletal-----	10	Moderate Texture/surface depth/rock fragments	0.50	Low	
Conic, bouldery, skeletal-----	10	Moderate Texture/surface depth/rock fragments	0.50	Low	
Arcadian, very stony	10	Moderate Texture/surface depth/rock fragments	0.50	Low	
2srqm:					
Quetico, bouldery----	40	Low		Low	
Insula, bouldery----	25	Low		Low	
Rock outcrop-----	15	Not rated		Not rated	
Conic, bouldery, skeletal-----	10	Moderate Texture/surface depth/rock fragments	0.50	Low	
Arcadian, very stony	10	Moderate Texture/surface depth/rock fragments	0.50	Low	
2srqn:					
Insula, very bouldery, skeletal	35	Moderate Texture/surface depth/rock fragments	0.50	Low	
Conic, very bouldery, skeletal	16	Moderate Texture/surface depth/rock fragments	0.50	Low	

# Soil Survey of Voyageurs National Park, Minnesota

Table 9.-Land Management, Part IV (Site Restoration)-Continued

Map unit symbol and soil name	Pct. of map unit	Potential for damage to soil by fire		Potential for seedling mortality	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srqn: Rock outcrop-----	15	Not rated		Not rated	
Metonga, very stony, skeletal----	14	Moderate Texture/surface depth/rock fragments	0.50	Low	
Quetico, very bouldery, skeletal	10	Moderate Texture/surface depth/rock fragments	0.50	Low	
Wahlsten, very stony	5	Moderate Texture/surface depth/rock fragments	0.50	Low	
Voyageurs-----	3	Low		High Wetness	1.00
Aquepts, very rubbly	2	Low		High Wetness	1.00
2srqp: Quetico, very bouldery, skeletal	31	Moderate Texture/surface depth/rock fragments	0.50	Moderate Available water	0.50
Insula, very bouldery, skeletal	30	Moderate Texture/surface depth/rock fragments	0.50	Low	
Greenwood-----	15	Low		High Wetness Soil reaction	1.00 0.50
Rock outcrop-----	9	Not rated		Not rated	
Merwin-----	5	Low		High Wetness Soil reaction	1.00 0.50
Aquepts, very rubbly	5	Low		High Wetness	1.00
Wahlsten, very stony	3	Moderate Texture/surface depth/rock fragments	0.50	Low	
Conic, very bouldery, skeletal	2	Moderate Texture/surface depth/rock fragments	0.50	Low	



# Soil Survey of Voyageurs National Park, Minnesota

Table 9.-Land Management, Part IV (Site Restoration)-Continued

Map unit symbol and soil name	Pct. of map unit	Potential for damage to soil by fire		Potential for seedling mortality	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srqr: Greenwood-----	80	Low		High Wetness Soil reaction	1.00 0.50
Merwin-----	10	Low		High Wetness Soil reaction	1.00 0.50
Rifle, moat-----	5	Low		High Wetness	1.00
Tacoosh, moat-----	5	Low		High Wetness	1.00
2srqs: Insula, very stony, skeletal-----	30	Moderate Texture/surface depth/rock fragments	0.50	Low	
Conic, very stony, skeletal-----	16	Moderate Texture/surface depth/rock fragments	0.50	Low	
Wahlsten, very stony	15	Moderate Texture/surface depth/rock fragments	0.50	Low	
Quetico, very stony, skeletal----	10	Moderate Texture/surface depth/rock fragments	0.50	Moderate Available water	0.50
Metonga, very stony, skeletal----	9	Moderate Texture/surface depth/rock fragments	0.50	Low	
Dishno, very stony, skeletal-----	9	Moderate Texture/surface depth/rock fragments	0.50	Low	
Aquepts, very rubbly	3	Low		High Wetness	1.00
Aquepts, stony, moderately slow Ksat-----	2	Low		High Wetness	1.00
Voyageurs-----	2	Low		High Wetness	1.00

# Soil Survey of Voyageurs National Park, Minnesota

Table 9.-Land Management, Part IV (Site Restoration)-Continued

Map unit symbol and soil name	Pct. of map unit	Potential for damage to soil by fire		Potential for seedling mortality	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srqs:					
Rock outcrop-----	2	Not rated		Not rated	
Foglake-----	1	Low		High Wetness	1.00
Eaglesnest, very stony-----	1	Low		Low	
2srqv:					
Voyageurs, oxyaquic	35	Low		Low	
Conic, very stony, skeletal-----	15	Moderate Texture/surface depth/rock fragments	0.50	Low	
Little Swan-----	20	Low		Moderate Wetness	0.50
Insula, very stony, skeletal-----	10	Moderate Texture/surface depth/rock fragments	0.50	Low	
Wahlsten, very stony	5	Moderate Texture/surface depth/rock fragments	0.50	Low	
Metonga, very stony, skeletal----	5	Moderate Texture/surface depth/rock fragments	0.50	Low	
Baudette-----	5	Low		Low	
Aquepts, stony, moderately slow Ksat-----	4	Low		High Wetness	1.00
Rock outcrop-----	1	Not rated		Not rated	
2srqw:					
Wahlsten, very stony	26	Moderate Texture/surface depth/rock fragments	0.50	Low	
Spooner-----	24	Low		High Wetness	1.00
Voyageurs-----	22	Low		High Wetness	1.00

# Soil Survey of Voyageurs National Park, Minnesota

Table 9.-Land Management, Part IV (Site Restoration)-Continued

Map unit symbol and soil name	Pct. of map unit	Potential for damage to soil by fire		Potential for seedling mortality	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srqw: Insula, very stony, skeletal-----	10	Moderate Texture/surface depth/rock fragments	0.50	Low	
Dishno, very stony, skeletal-----	9	Moderate Texture/surface depth/rock fragments	0.50	Low	
Aquepts, stony, moderately slow Ksat-----	3	Low		High Wetness	1.00
Little Swan-----	3	Low		Moderate Wetness	0.50
Aquepts, very rubbly	2	Low		High Wetness	1.00
Rock outcrop-----	1	Not rated		Not rated	
2srqy: Baudette-----	40	Low		Low	
Little Swan-----	35	Low		Moderate Wetness	0.50
Voyageurs-----	10	Low		High Wetness	1.00
Wahlsten, very stony	5	Moderate Texture/surface depth/rock fragments	0.50	Low	
Insula, very stony, skeletal-----	5	Moderate Texture/surface depth/rock fragments	0.50	Low	
Spooner-----	5	Low		High Wetness	1.00
2srqz: Canthook-----	30	Low		High Wetness	1.00
Durkeelake-----	30	Low		Low	
Bootleg-----	10	Low		High Wetness	1.00
Udipsamments-----	10	Low		Low	

# Soil Survey of Voyageurs National Park, Minnesota

Table 9.-Land Management, Part IV (Site Restoration)-Continued

Map unit symbol and soil name	Pct. of map unit	Potential for damage to soil by fire		Potential for seedling mortality	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srqz: Grytal-----	10	High Texture/surface layer thickness/rock fragments	1.00	Low	
Voyageurs-----	5	Low		High Wetness	1.00
Aquepts, stony, moderately slow Ksat-----	5	Low		High Wetness	1.00
2srr3: Spoonier-----	40	Low		High Wetness	1.00
Sax-----	35	Low		High Wetness	1.00
Spoonier, till/bedrock substratum-----	5	Low		High Wetness	1.00
Foglake-----	5	Low		High Wetness	1.00
Little Swan-----	5	Low		Moderate Wetness	0.50
Bootleg-----	5	Low		High Wetness	1.00
Canthook-----	5	Low		High Wetness	1.00
2srr4: Little Swan-----	40	Low		Moderate Wetness	0.50
Spoonier-----	25	Low		High Wetness	1.00
Voyageurs-----	10	Low		High Wetness	1.00
Spoonier, till/bedrock substratum-----	5	Low		High Wetness	1.00
Sax-----	5	Low		High Wetness	1.00
Foglake-----	5	Low		High Wetness	1.00

# Soil Survey of Voyageurs National Park, Minnesota

Table 9.-Land Management, Part IV (Site Restoration)-Continued

Map unit symbol and soil name	Pct. of map unit	Potential for damage to soil by fire		Potential for seedling mortality	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srr4: Bootleg-----	5	Low		High Wetness	1.00
Canthook-----	5	Low		High Wetness	1.00
2srr7: Mooselake-----	80	Low		High Wetness	1.00
Tacoosh, moat-----	10	Low		High Wetness	1.00
Rifle-----	5	Low		High Wetness	1.00
Cathro, moat-----	5	Low		High Wetness	1.00
2srr8: Rifle-----	80	Low		High Wetness	1.00
Tacoosh, moat-----	10	Low		High Wetness	1.00
Greenwood-----	5	Low		High Wetness Soil reaction	1.00 0.50
Aquepts, stony, moderately slow Ksat-----	5	Low		High Wetness	1.00
2srr9: Tacoosh, frequently flooded-----	40	Low		High Wetness	1.00
Sax, frequently flooded-----	35	Low		High Wetness	1.00
Cathro, frequently flooded-----	10	Low		High Wetness	1.00
Rifle, frequently flooded-----	10	Low		High Wetness	1.00
Hassman, frequently flooded-----	5	Low		High Wetness	1.00
2srrb: Aquepts, ponded-----	30	Low		High Wetness	1.00



# Soil Survey of Voyageurs National Park, Minnesota

Table 9.-Land Management, Part IV (Site Restoration)-Continued

Map unit symbol and soil name	Pct. of map unit	Potential for damage to soil by fire		Potential for seedling mortality	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srrb: Sax, ponded-----	25	Low		High Wetness	1.00
Tacoosh, ponded-----	25	Low		High Wetness	1.00
Rifle, ponded-----	10	Low		High Wetness	1.00
Hassman, ponded-----	10	Low		High Wetness	1.00
2srrh: Greenwood, seasonally ponded--	80	Low		High Wetness Soil reaction	1.00 0.50
Merwin, seasonally ponded-----	10	Low		High Wetness Soil reaction	1.00 0.50
Rifle, seasonally ponded-----	5	Low		High Wetness	1.00
Tacoosh, seasonally ponded-----	5	Low		High Wetness	1.00
2srrj: Rifle, seasonally ponded-----	80	Low		High Wetness	1.00
Tacoosh, seasonally ponded-----	10	Low		High Wetness	1.00
Greenwood, seasonally ponded--	5	Low		High Wetness Soil reaction	1.00 0.50
Aquepts, stony, moderately slow Ksat-----	5	Low		High Wetness	1.00
2srrk: Insula, very stony, skeletal-----	30	Moderate Texture/surface depth/rock fragments	0.50	Low	

# Soil Survey of Voyageurs National Park, Minnesota

Table 9.-Land Management, Part IV (Site Restoration)-Continued

Map unit symbol and soil name	Pct. of map unit	Potential for damage to soil by fire		Potential for seedling mortality	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srrk: Conic, very stony, skeletal-----	16	Moderate Texture/surface depth/rock fragments	0.50	Low	
Wahlsten, very stony	15	Moderate Texture/surface depth/rock fragments	0.50	Low	
Quetico, very stony, skeletal----	10	Moderate Texture/surface depth/rock fragments	0.50	Low	
Metonga, very stony, skeletal----	9	Moderate Texture/surface depth/rock fragments	0.50	Low	
Dishno, very stony, skeletal-----	9	Moderate Texture/surface depth/rock fragments	0.50	Low	
Aquepts, very rubbly	3	Low		High Wetness	1.00
Aquepts, stony, moderately slow Ksat-----	2	Low		High Wetness	1.00
Voyageurs-----	2	Low		High Wetness	1.00
Rock outcrop-----	2	Not rated		Not rated	
Foglake-----	1	Low		High Wetness	1.00
Eaglesnest, very stony-----	1	Low		Low	
2srri: Tacoosh, occasionally flooded-----	40	Low		High Wetness	1.00
Sax, occasionally flooded-----	35	Low		High Wetness	1.00

# Soil Survey of Voyageurs National Park, Minnesota

Table 9.-Land Management, Part IV (Site Restoration)-Continued

Map unit symbol and soil name	Pct. of map unit	Potential for damage to soil by fire		Potential for seedling mortality	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srrl: Cathro, occasionally flooded-----	10	Low		High Wetness	1.00
Rifle, occasionally flooded-----	10	Low		High Wetness	1.00
Hassman, occasionally flooded-----	5	Low		High Wetness	1.00
2srrm: Brickton-----	40	Low		High Wetness	1.00
Hassman-----	35	Low		High Wetness	1.00
Spooner, till/bedrock substratum-----	5	Low		High Wetness	1.00
Foglake-----	5	Low		High Wetness	1.00
Dalbo-----	5	Low		High Wetness	1.00
Bootleg-----	5	Low		High Wetness	1.00
Tacoosh-----	5	Low		High Wetness	1.00
2srrn: Brickton-----	60	Low		High Wetness	1.00
Dalbo-----	15	Low		High Wetness	1.00
Voyageurs-----	5	Low		High Wetness	1.00
Foglake-----	5	Low		High Wetness	1.00
Spooner, till/bedrock substratum-----	5	Low		High Wetness	1.00
Bootleg-----	5	Low		High Wetness	1.00
Hassman-----	5	Low		High Wetness	1.00

# Soil Survey of Voyageurs National Park, Minnesota

Table 9.-Land Management, Part IV (Site Restoration)-Continued

Map unit symbol and soil name	Pct. of map unit	Potential for damage to soil by fire		Potential for seedling mortality	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srrq: Cathro, ponded-----	60	Low		High Wetness	1.00
Tacoosh, ponded-----	30	Low		High Wetness	1.00
Sax, ponded-----	5	Low		High Wetness	1.00
Aquepts, stony, moderately slow Ksat-----	5	Low		High Wetness	1.00
2srrr: Insula, very stony, skeletal-----	30	Moderate Texture/surface depth/rock fragments	0.50	Low	
Voyageurs-----	20	Low		High Wetness	1.00
Wahlsten, very stony	15	Moderate Texture/surface depth/rock fragments	0.50	Low	
Conic, very stony, skeletal-----	10	Moderate Texture/surface depth/rock fragments	0.50	Low	
Spooner, till/bedrock substratum-----	8	Low		High Wetness	1.00
Brickton-----	5	Low		High Wetness	1.00
Dishno, very stony, skeletal-----	5	Moderate Texture/surface depth/rock fragments	0.50	Low	
Aquepts, very rubbly	3	Low		High Wetness	1.00
Aquepts, stony, moderately slow Ksat-----	2	Low		High Wetness	1.00
Rock outcrop-----	2	Not rated		Not rated	

# Soil Survey of Voyageurs National Park, Minnesota

Table 9.-Land Management, Part IV (Site Restoration)-Continued

Map unit symbol and soil name	Pct. of map unit	Potential for damage to soil by fire		Potential for seedling mortality	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srst: Bowstring, frequently flooded	50	Low		High Wetness	1.00
Fluvaquents, frequently flooded	40	Low		High Wetness	1.00
Cathro, frequently flooded-----	10	Low		High Wetness	1.00
W: Water-----	100	Not rated		Not rated	

# Soil Survey of Voyageurs National Park, Minnesota

Table 10.—Recreation, Part I (Camp and Picnic Areas)

(Onsite investigation may be needed to validate the interpretations in this table and to confirm the identity of the soil on a given site. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table)

Map unit symbol and soil name	Pct. of map unit	Camp areas		Picnic areas	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srmd: Quetico, bouldery----	35	Very limited Depth to bedrock Slope	1.00 0.16	Very limited Depth to bedrock Slope	1.00 0.16
Insula, bouldery----	20	Very limited Depth to bedrock Slope	1.00 0.16	Very limited Depth to bedrock Slope	1.00 0.16
Rock outcrop-----	15	Not rated		Not rated	
Wahlsten, bouldery, skeletal-----	10	Somewhat limited Depth to saturated zone Large stones content	0.39 0.07	Somewhat limited Depth to saturated zone Large stones content	0.19 0.07
Conic, bouldery, skeletal-----	10	Somewhat limited Slope Large stones content	0.16 0.07	Somewhat limited Slope Large stones content	0.16 0.07
Arcadian, very stony	10	Very limited Slope Depth to bedrock Large stones content	1.00 1.00 0.35	Very limited Slope Depth to bedrock Large stones content	1.00 1.00 0.35
2srqm: Quetico, bouldery---	40	Very limited Depth to bedrock Slope	1.00 1.00	Very limited Depth to bedrock Slope	1.00 1.00
Insula, bouldery----	25	Very limited Slope Depth to bedrock	1.00 1.00	Very limited Slope Depth to bedrock	1.00 1.00
Rock outcrop-----	15	Not rated		Not rated	
Conic, bouldery, skeletal-----	10	Somewhat limited Slope Large stones content	0.16 0.07	Somewhat limited Slope Large stones content	0.16 0.07
Arcadian, very stony	10	Very limited Slope Depth to bedrock Large stones content	1.00 1.00 0.35	Very limited Slope Depth to bedrock Large stones content	1.00 1.00 0.35



# Soil Survey of Voyageurs National Park, Minnesota

Table 10.—Recreation, Part I (Camp and Picnic Areas)—Continued

Map unit symbol and soil name	Pct. of map unit	Camp areas		Picnic areas	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srqn: Insula, very bouldery, skeletal	35	Very limited Slope Depth to bedrock Large stones content Too sandy	1.00 1.00 0.77 0.01	Very limited Slope Depth to bedrock Large stones content Too sandy	1.00 1.00 0.77 0.01
Conic, very bouldery, skeletal	16	Very limited Slope Large stones content	1.00 0.35	Very limited Slope Large stones content	1.00 0.35
Rock outcrop-----	15	Not rated		Not rated	
Metonga, very stony, skeletal----	14	Somewhat limited Large stones content	0.35	Somewhat limited Large stones content	0.35
Quetico, very bouldery, skeletal	10	Very limited Depth to bedrock Slope Large stones content Too sandy	1.00 1.00 0.80 0.01	Very limited Depth to bedrock Slope Large stones content Too sandy	1.00 1.00 0.80 0.01
Wahlsten, very stony	5	Somewhat limited Gravel content Depth to saturated zone Large stones content	0.51 0.39 0.04	Somewhat limited Gravel content Depth to saturated zone Large stones content	0.51 0.19 0.04
Voyageurs-----	3	Very limited Depth to saturated zone Slow water movement	1.00 0.22	Very limited Depth to saturated zone Slow water movement	1.00 0.22
Aquepts, very rubbly	2	Very limited Depth to saturated zone Ponding Large stones content	1.00 1.00 1.00	Very limited Large stones content Ponding Depth to saturated zone	1.00 1.00 1.00
2srqp: Quetico, very bouldery, skeletal	31	Very limited Depth to bedrock Large stones content Slope Too sandy	1.00 0.80 0.16 0.01	Very limited Depth to bedrock Large stones content Slope Too sandy	1.00 0.80 0.16 0.01

# Soil Survey of Voyageurs National Park, Minnesota

Table 10.—Recreation, Part I (Camp and Picnic Areas)—Continued

Map unit symbol and soil name	Pct. of map unit	Camp areas		Picnic areas	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srqp: Insula, very bouldery, skeletal	30	Very limited Depth to bedrock Large stones content Too sandy	1.00 0.77 0.01	Very limited Depth to bedrock Large stones content Too sandy	1.00 0.77 0.01
Greenwood-----	15	Very limited Depth to saturated zone Organic matter content	1.00 1.00	Very limited Depth to saturated zone Organic matter content	1.00 1.00
Rock outcrop-----	9	Not rated		Not rated	
Merwin-----	5	Very limited Depth to saturated zone Ponding Organic matter content Slow water movement	1.00 1.00 1.00 0.22	Very limited Ponding Depth to saturated zone Organic matter content Slow water movement	1.00 1.00 1.00 0.22
Aquepts, very rubbly	5	Very limited Depth to saturated zone Ponding Large stones content	1.00 1.00 1.00	Very limited Large stones content Ponding Depth to saturated zone	1.00 1.00 1.00
Wahlsten, very stony	3	Somewhat limited Gravel content Depth to saturated zone Large stones content	0.51 0.39 0.04	Somewhat limited Gravel content Depth to saturated zone Large stones content	0.51 0.19 0.04
Conic, very bouldery, skeletal	2	Somewhat limited Large stones content Slope	0.35 0.16	Somewhat limited Large stones content Slope	0.35 0.16
2srqr: Greenwood-----	80	Very limited Depth to saturated zone Organic matter content	1.00 1.00	Very limited Depth to saturated zone Organic matter content	1.00 1.00
Merwin-----	10	Very limited Depth to saturated zone Ponding Organic matter content Slow water movement	1.00 1.00 1.00 0.22	Very limited Ponding Depth to saturated zone Organic matter content Slow water movement	1.00 1.00 1.00 0.22

# Soil Survey of Voyageurs National Park, Minnesota

Table 10.—Recreation, Part I (Camp and Picnic Areas)—Continued

Map unit symbol and soil name	Pct. of map unit	Camp areas		Picnic areas	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srqr: Rifle, moat-----	5	Very limited Depth to saturated zone Ponding Organic matter content	1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Organic matter content	1.00 1.00 1.00
Tacoosh, moat-----	5	Very limited Depth to saturated zone Ponding Organic matter content	1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Organic matter content	1.00 1.00 1.00
2srqs: Insula, very stony, skeletal-----	30	Very limited Depth to bedrock Large stones content Slope Too sandy	1.00 0.77 0.16 0.01	Very limited Depth to bedrock Large stones content Slope Too sandy	1.00 0.77 0.16 0.01
Conic, very stony, skeletal-----	16	Somewhat limited Large stones content	0.35	Somewhat limited Large stones content	0.35
Wahlsten, very stony	15	Somewhat limited Gravel content Depth to saturated zone Large stones content	0.51 0.39 0.04	Somewhat limited Gravel content Depth to saturated zone Large stones content	0.51 0.19 0.04
Quetico, very stony, skeletal----	10	Very limited Depth to bedrock Large stones content Slope Too sandy	1.00 0.80 0.16 0.01	Very limited Depth to bedrock Large stones content Slope Too sandy	1.00 0.80 0.16 0.01
Metonga, very stony, skeletal----	9	Somewhat limited Large stones content	0.35	Somewhat limited Large stones content	0.35
Dishno, very stony, skeletal-----	9	Somewhat limited Gravel content Depth to saturated zone Large stones content	0.59 0.39 0.04	Somewhat limited Gravel content Depth to saturated zone Large stones content	0.59 0.19 0.04

# Soil Survey of Voyageurs National Park, Minnesota

Table 10.—Recreation, Part I (Camp and Picnic Areas)—Continued

Map unit symbol and soil name	Pct. of map unit	Camp areas		Picnic areas	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srqs: Aquepts, very rubbly	3	Very limited Depth to saturated zone Ponding Large stones content	1.00 1.00 1.00	Very limited Large stones content Ponding Depth to saturated zone	1.00 1.00 1.00
Aquepts, stony, moderately slow Ksat-----	2	Very limited Depth to saturated zone Ponding Slow water movement	1.00 1.00 0.22	Very limited Ponding Depth to saturated zone Slow water movement	1.00 1.00 0.22
Voyageurs-----	2	Very limited Depth to saturated zone Slow water movement	1.00 0.22	Very limited Depth to saturated zone Slow water movement	1.00 0.22
Rock outcrop-----	2	Not rated		Not rated	
Foglake-----	1	Very limited Depth to saturated zone Slow water movement	1.00 0.96	Very limited Depth to saturated zone Slow water movement	1.00 0.96
Eaglesnest, very stony-----	1	Somewhat limited Gravel content Depth to saturated zone Large stones content	0.96 0.39 0.04	Somewhat limited Gravel content Depth to saturated zone Large stones content	0.96 0.19 0.04
2srqv: Voyageurs, oxyaquic	35	Somewhat limited Slow water movement	0.22	Somewhat limited Slow water movement	0.22
Conic, very stony, skeletal-----	15	Somewhat limited Large stones content	0.35	Somewhat limited Large stones content	0.35
Littleswan-----	20	Somewhat limited Depth to saturated zone Slow water movement	0.98 0.22	Somewhat limited Depth to saturated zone Slow water movement	0.75 0.22
Insula, very stony, skeletal-----	10	Very limited Depth to bedrock Large stones content Slope Too sandy	1.00 0.77 0.16 0.01	Very limited Depth to bedrock Large stones content Slope Too sandy	1.00 0.77 0.16 0.01

# Soil Survey of Voyageurs National Park, Minnesota

Table 10.—Recreation, Part I (Camp and Picnic Areas)—Continued

Map unit symbol and soil name	Pct. of map unit	Camp areas		Picnic areas	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srqv: Wahlsten, very stony	5	Somewhat limited Gravel content Depth to saturated zone Large stones content	0.51 0.39 0.04	Somewhat limited Gravel content Depth to saturated zone Large stones content	0.51 0.19 0.04
Metonga, very stony, skeletal----	5	Somewhat limited Large stones content	0.35	Somewhat limited Large stones content	0.35
Baudette-----	5	Somewhat limited Slow water movement	0.22	Somewhat limited Slow water movement	0.22
Aquepts, stony, moderately slow Ksat-----	4	Very limited Depth to saturated zone Ponding Slow water movement	1.00 1.00 0.22	Very limited Ponding Depth to saturated zone Slow water movement	1.00 1.00 0.22
Rock outcrop-----	1	Not rated		Not rated	
2srqw: Wahlsten, very stony	26	Somewhat limited Gravel content Depth to saturated zone Large stones content	0.51 0.39 0.04	Somewhat limited Gravel content Depth to saturated zone Large stones content	0.51 0.19 0.04
Spooner-----	24	Very limited Depth to saturated zone Slow water movement	1.00 0.22	Very limited Depth to saturated zone Slow water movement	1.00 0.22
Voyageurs-----	22	Very limited Depth to saturated zone Slow water movement	1.00 0.22	Very limited Depth to saturated zone Slow water movement	1.00 0.22
Insula, very stony, skeletal-----	10	Very limited Depth to bedrock Large stones content Too sandy	1.00 0.77 0.01	Very limited Depth to bedrock Large stones content Too sandy	1.00 0.77 0.01
Dishno, very stony, skeletal-----	9	Somewhat limited Gravel content Depth to saturated zone Large stones content	0.59 0.39 0.04	Somewhat limited Gravel content Depth to saturated zone Large stones content	0.59 0.19 0.04

# Soil Survey of Voyageurs National Park, Minnesota

Table 10.—Recreation, Part I (Camp and Picnic Areas)—Continued

Map unit symbol and soil name	Pct. of map unit	Camp areas		Picnic areas	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srqw: Aquepts, stony, moderately slow Ksat-----	3	Very limited Depth to saturated zone Ponding Slow water movement	1.00  1.00 0.22	Very limited Ponding Depth to saturated zone Slow water movement	1.00 1.00  0.22
Littleswan-----	3	Somewhat limited Depth to saturated zone Slow water movement	0.98  0.22	Somewhat limited Depth to saturated zone Slow water movement	0.75  0.22
Aquepts, very rubbly	2	Very limited Depth to saturated zone Ponding Large stones content	1.00  1.00 1.00	Very limited Large stones content Ponding Depth to saturated zone	1.00  1.00 1.00
Rock outcrop-----	1	Not rated		Not rated	
2srqy: Baudette-----	40	Somewhat limited Slow water movement	0.22	Somewhat limited Slow water movement	0.22
Littleswan-----	35	Somewhat limited Depth to saturated zone Slow water movement	0.98  0.22	Somewhat limited Depth to saturated zone Slow water movement	0.75  0.22
Voyageurs-----	10	Very limited Depth to saturated zone Slow water movement	1.00  0.22	Very limited Depth to saturated zone Slow water movement	1.00  0.22
Wahlsten, very stony	5	Somewhat limited Gravel content Depth to saturated zone Large stones content	0.51 0.39 0.04	Somewhat limited Gravel content Depth to saturated zone Large stones content	0.51 0.19 0.04
Insula, very stony, skeletal-----	5	Very limited Depth to bedrock Large stones content Too sandy	1.00 0.77 0.01	Very limited Depth to bedrock Large stones content Too sandy	1.00 0.77 0.01
Spooner-----	5	Very limited Depth to saturated zone Slow water movement	1.00  0.22	Very limited Depth to saturated zone Slow water movement	1.00  0.22



# Soil Survey of Voyageurs National Park, Minnesota

Table 10.—Recreation, Part I (Camp and Picnic Areas)—Continued

Map unit symbol and soil name	Pct. of map unit	Camp areas		Picnic areas	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srqz: Canthook-----	30	Very limited Depth to saturated zone Slow water movement	1.00  0.96	Very limited Depth to saturated zone Slow water movement	1.00  0.96
Durkeelake-----	30	Somewhat limited Depth to saturated zone Slow water movement Too sandy	0.44  0.22 0.08	Somewhat limited Slow water movement Depth to saturated zone Too sandy	0.22  0.22 0.08
Bootleg-----	10	Very limited Depth to saturated zone Slow water movement	1.00  0.96	Very limited Depth to saturated zone Slow water movement	1.00  0.96
Udipsammets-----	10	Very limited Too sandy	1.00	Very limited Too sandy	1.00
Grytal-----	10	Somewhat limited Too sandy	0.82	Somewhat limited Too sandy	0.82
Voyageurs-----	5	Very limited Depth to saturated zone Slow water movement	1.00  0.22	Very limited Depth to saturated zone Slow water movement	1.00  0.22
Aquepts, stony, moderately slow Ksat-----	5	Very limited Depth to saturated zone Ponding Slow water movement	1.00  1.00 0.22	Very limited Ponding Depth to saturated zone Slow water movement	1.00  1.00 0.22
2srr3: Spoonier-----	40	Very limited Depth to saturated zone Slow water movement	1.00  0.22	Very limited Depth to saturated zone Slow water movement	1.00  0.22
Sax-----	35	Very limited Depth to saturated zone Ponding	1.00  1.00	Very limited Ponding Depth to saturated zone	1.00  1.00
Spooner, till/bedrock substratum-----	5	Very limited Depth to saturated zone Slow water movement	1.00  0.22	Very limited Depth to saturated zone Slow water movement	1.00  0.22

# Soil Survey of Voyageurs National Park, Minnesota

Table 10.—Recreation, Part I (Camp and Picnic Areas)—Continued

Map unit symbol and soil name	Pct. of map unit	Camp areas		Picnic areas	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srr3: Foglake-----	5	Very limited Depth to saturated zone Slow water movement	1.00  0.96	Very limited Depth to saturated zone Slow water movement	1.00  0.96
Littleswan-----	5	Somewhat limited Depth to saturated zone Slow water movement	0.98  0.22	Somewhat limited Depth to saturated zone Slow water movement	0.75  0.22
Bootleg-----	5	Very limited Depth to saturated zone Slow water movement	1.00  0.96	Very limited Depth to saturated zone Slow water movement	1.00  0.96
Canthook-----	5	Very limited Depth to saturated zone Slow water movement	1.00  0.96	Very limited Depth to saturated zone Slow water movement	1.00  0.96
2srr4: Littleswan-----	40	Somewhat limited Depth to saturated zone Slow water movement	0.98  0.22	Somewhat limited Depth to saturated zone Slow water movement	0.75  0.22
Spooner-----	25	Very limited Depth to saturated zone Slow water movement	1.00  0.22	Very limited Depth to saturated zone Slow water movement	1.00  0.22
Voyageurs-----	10	Very limited Depth to saturated zone Slow water movement	1.00  0.22	Very limited Depth to saturated zone Slow water movement	1.00  0.22
Spooner, till/bedrock substratum-----	5	Very limited Depth to saturated zone Slow water movement	1.00  0.22	Very limited Depth to saturated zone Slow water movement	1.00  0.22
Sax-----	5	Very limited Depth to saturated zone Ponding	1.00  1.00	Very limited Ponding Depth to saturated zone	1.00  1.00
Foglake-----	5	Very limited Depth to saturated zone Slow water movement	1.00  0.96	Very limited Depth to saturated zone Slow water movement	1.00  0.96

# Soil Survey of Voyageurs National Park, Minnesota

Table 10.—Recreation, Part I (Camp and Picnic Areas)—Continued

Map unit symbol and soil name	Pct. of map unit	Camp areas		Picnic areas	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srr4: Bootleg-----	5	Very limited Depth to saturated zone Slow water movement	1.00  0.96	Very limited Depth to saturated zone Slow water movement	1.00  0.96
Canthook-----	5	Very limited Depth to saturated zone Slow water movement	1.00  0.96	Very limited Depth to saturated zone Slow water movement	1.00  0.96
2srr7: Mooselake-----	80	Very limited Depth to saturated zone Ponding Organic matter content	1.00  1.00 1.00	Very limited Ponding Depth to saturated zone Organic matter content	1.00  1.00 1.00
Tacoosh, moat-----	10	Very limited Depth to saturated zone Ponding Organic matter content	1.00  1.00 1.00	Very limited Ponding Depth to saturated zone Organic matter content	1.00  1.00 1.00
Rifle-----	5	Very limited Depth to saturated zone Ponding Organic matter content	1.00  1.00 1.00	Very limited Ponding Depth to saturated zone Organic matter content	1.00  1.00 1.00
Cathro, moat-----	5	Very limited Depth to saturated zone Ponding Organic matter content Slow water movement	1.00  1.00 1.00  0.22	Very limited Ponding Depth to saturated zone Organic matter content Slow water movement	1.00  1.00 1.00  0.22
2srr8: Rifle-----	80	Very limited Depth to saturated zone Ponding Organic matter content	1.00  1.00 1.00	Very limited Ponding Depth to saturated zone Organic matter content	1.00  1.00 1.00
Tacoosh, moat-----	10	Very limited Depth to saturated zone Ponding Organic matter content	1.00  1.00 1.00	Very limited Ponding Depth to saturated zone Organic matter content	1.00  1.00 1.00

# Soil Survey of Voyageurs National Park, Minnesota

Table 10.—Recreation, Part I (Camp and Picnic Areas)—Continued

Map unit symbol and soil name	Pct. of map unit	Camp areas		Picnic areas	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srr8: Greenwood-----	5	Very limited Depth to saturated zone Organic matter content	1.00  1.00	Very limited Depth to saturated zone Organic matter content	1.00  1.00
Aquepts, stony, moderately slow Ksat-----	5	Very limited Depth to saturated zone Ponding Slow water movement	1.00  1.00 0.22	Very limited Ponding Depth to saturated zone Slow water movement	1.00  1.00 0.22
2srr9: Tacoosh, frequently flooded-----	40	Very limited Depth to saturated zone Flooding Organic matter content	1.00  1.00 1.00	Very limited Depth to saturated zone Organic matter content Flooding	1.00  1.00  0.40
Sax, frequently flooded-----	35	Very limited Depth to saturated zone Flooding	1.00  1.00	Very limited Depth to saturated zone Flooding	1.00  0.40
Cathro, frequently flooded-----	10	Very limited Depth to saturated zone Flooding Organic matter content Slow water movement	1.00  1.00 1.00 0.22	Very limited Depth to saturated zone Organic matter content Flooding Slow water movement	1.00  1.00  0.40 0.22
Rifle, frequently flooded-----	10	Very limited Depth to saturated zone Flooding Organic matter content	1.00  1.00 1.00	Very limited Depth to saturated zone Organic matter content Flooding	1.00  1.00  0.40
Hassman, frequently flooded-----	5	Very limited Depth to saturated zone Flooding Slow water movement	1.00  1.00 0.96 0.96	Very limited Depth to saturated zone Slow water movement Flooding	1.00  0.96  0.40

# Soil Survey of Voyageurs National Park, Minnesota

Table 10.—Recreation, Part I (Camp and Picnic Areas)—Continued

Map unit symbol and soil name	Pct. of map unit	Camp areas		Picnic areas	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srrb: Aquentz, ponded-----	30	Very limited Depth to saturated zone Ponding	1.00 1.00 1.00	Very limited Ponding Depth to saturated zone	1.00 1.00 1.00
Sax, ponded-----	25	Very limited Depth to saturated zone Ponding	1.00 1.00 1.00	Very limited Ponding Depth to saturated zone	1.00 1.00 1.00
Tacoosh, ponded-----	25	Very limited Depth to saturated zone Ponding Organic matter content	1.00 1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Organic matter content	1.00 1.00 1.00 1.00
Rifle, ponded-----	10	Very limited Depth to saturated zone Ponding Organic matter content	1.00 1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Organic matter content	1.00 1.00 1.00 1.00
Hassman, ponded-----	10	Very limited Depth to saturated zone Ponding Slow water movement	1.00 1.00 1.00 0.96	Very limited Ponding Depth to saturated zone Slow water movement	1.00 1.00 1.00 0.96
2srrh: Greenwood, seasonally ponded--	80	Very limited Depth to saturated zone Ponding Organic matter content	1.00 1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Organic matter content	1.00 1.00 1.00 1.00
Merwin, seasonally ponded-----	10	Very limited Depth to saturated zone Ponding Organic matter content Slow water movement	1.00 1.00 1.00 1.00 0.22	Very limited Ponding Depth to saturated zone Organic matter content Slow water movement	1.00 1.00 1.00 1.00 0.22
Rifle, seasonally ponded-----	5	Very limited Depth to saturated zone Ponding Organic matter content	1.00 1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Organic matter content	1.00 1.00 1.00 1.00

# Soil Survey of Voyageurs National Park, Minnesota

Table 10.—Recreation, Part I (Camp and Picnic Areas)—Continued

Map unit symbol and soil name	Pct. of map unit	Camp areas		Picnic areas	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srrh: Tacoosh, seasonally ponded-----	5	Very limited Depth to saturated zone Ponding Organic matter content	1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Organic matter content	1.00 1.00 1.00
2srrj: Rifle, seasonally ponded-----	80	Very limited Depth to saturated zone Ponding Organic matter content	1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Organic matter content	1.00 1.00 1.00
Tacoosh, seasonally ponded-----	10	Very limited Depth to saturated zone Ponding Organic matter content	1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Organic matter content	1.00 1.00 1.00
Greenwood, seasonally ponded--	5	Very limited Depth to saturated zone Ponding Organic matter content	1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Organic matter content	1.00 1.00 1.00
Aquepts, stony, moderately slow Ksat-----	5	Very limited Depth to saturated zone Ponding Slow water movement	1.00 1.00 0.22	Very limited Ponding Depth to saturated zone Slow water movement	1.00 1.00 0.22
2srrk: Insula, very stony, skeletal-----	30	Very limited Slope Depth to bedrock Large stones content Too sandy	1.00 1.00 0.77 0.01	Very limited Slope Depth to bedrock Large stones content Too sandy	1.00 1.00 0.77 0.01
Conic, very stony, skeletal-----	16	Somewhat limited Large stones content	0.35	Somewhat limited Large stones content	0.35



# Soil Survey of Voyageurs National Park, Minnesota

Table 10.—Recreation, Part I (Camp and Picnic Areas)—Continued

Map unit symbol and soil name	Pct. of map unit	Camp areas		Picnic areas	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srrk: Wahlsten, very stony	15	Somewhat limited Gravel content Depth to saturated zone Large stones content	0.51 0.39 0.04	Somewhat limited Gravel content Depth to saturated zone Large stones content	0.51 0.19 0.04
Quetico, very stony, skeletal----	10	Very limited Depth to bedrock Slope Large stones content Too sandy	1.00 1.00 0.80 0.01	Very limited Depth to bedrock Slope Large stones content Too sandy	1.00 1.00 0.80 0.01
Metonga, very stony, skeletal----	9	Somewhat limited Large stones content	0.35	Somewhat limited Large stones content	0.35
Dishno, very stony, skeletal-----	9	Somewhat limited Gravel content Depth to saturated zone Large stones content	0.59 0.39 0.04	Somewhat limited Gravel content Depth to saturated zone Large stones content	0.59 0.19 0.04
Aquepts, very rubbly	3	Very limited Depth to saturated zone Ponding Large stones content	1.00 1.00 1.00	Very limited Large stones content Ponding Depth to saturated zone	1.00 1.00 1.00
Aquepts, stony, moderately slow Ksat-----	2	Very limited Depth to saturated zone Ponding Slow water movement	1.00 1.00 0.22	Very limited Ponding Depth to saturated zone Slow water movement	1.00 1.00 0.22
Voyageurs-----	2	Very limited Depth to saturated zone Slow water movement	1.00 0.22	Very limited Depth to saturated zone Slow water movement	1.00 0.22
Rock outcrop-----	2	Not rated		Not rated	
Foglake-----	1	Very limited Depth to saturated zone Slow water movement	1.00 0.96	Very limited Depth to saturated zone Slow water movement	1.00 0.96

# Soil Survey of Voyageurs National Park, Minnesota

Table 10.—Recreation, Part I (Camp and Picnic Areas)—Continued

Map unit symbol and soil name	Pct. of map unit	Camp areas		Picnic areas	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srrk: Eaglesnest, very stony-----	1	Somewhat limited Gravel content Depth to saturated zone Slope Large stones content	0.96 0.39  0.16 0.04	Somewhat limited Gravel content Depth to saturated zone Slope Large stones content	0.96 0.19  0.16 0.04
2srrl: Tacoosh, occasionally flooded-----	40	Very limited Depth to saturated zone Flooding Organic matter content	1.00  1.00 1.00	Very limited Depth to saturated zone Organic matter content	1.00  1.00
Sax, occasionally flooded-----	35	Very limited Depth to saturated zone Flooding	1.00  1.00	Very limited Depth to saturated zone	1.00
Cathro, occasionally flooded-----	10	Very limited Depth to saturated zone Flooding Organic matter content Slow water movement	1.00  1.00 1.00  0.22	Very limited Depth to saturated zone Organic matter content Slow water movement	1.00  1.00  0.22
Rifle, occasionally flooded-----	10	Very limited Depth to saturated zone Flooding Organic matter content	1.00  1.00 1.00	Very limited Depth to saturated zone Organic matter content	1.00  1.00
Hassman, occasionally flooded-----	5	Very limited Depth to saturated zone Flooding Slow water movement	1.00  1.00 0.96	Very limited Depth to saturated zone Slow water movement	1.00  0.96
2srrm: Brickton-----	40	Very limited Depth to saturated zone Slow water movement	1.00  0.96	Very limited Depth to saturated zone Slow water movement	1.00  0.96

# Soil Survey of Voyageurs National Park, Minnesota

Table 10.—Recreation, Part I (Camp and Picnic Areas)—Continued

Map unit symbol and soil name	Pct. of map unit	Camp areas		Picnic areas	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srrm: Hassman-----	35	Very limited Depth to saturated zone Ponding Slow water movement	1.00  1.00 0.96	Very limited Ponding Depth to saturated zone Slow water movement	1.00 1.00  0.96
Spooner, till/bedrock substratum-----	5	Very limited Depth to saturated zone Slow water movement	1.00  0.22	Very limited Depth to saturated zone Slow water movement	1.00  0.22
Foglake-----	5	Very limited Depth to saturated zone Slow water movement	1.00  0.96	Very limited Depth to saturated zone Slow water movement	1.00  0.96
Dalbo-----	5	Very limited Depth to saturated zone Slow water movement	1.00  0.96	Very limited Depth to saturated zone Slow water movement	1.00  0.96
Bootleg-----	5	Very limited Depth to saturated zone Slow water movement	1.00  0.96	Very limited Depth to saturated zone Slow water movement	1.00  0.96
Tacoosh-----	5	Very limited Depth to saturated zone Ponding Organic matter content	1.00  1.00 1.00	Very limited Ponding Depth to saturated zone Organic matter content	1.00 1.00  1.00
2srrn: Brickton-----	60	Very limited Depth to saturated zone Slow water movement	1.00  0.96	Very limited Depth to saturated zone Slow water movement	1.00  0.96
Dalbo-----	15	Very limited Depth to saturated zone Slow water movement	1.00  0.96	Very limited Depth to saturated zone Slow water movement	1.00  0.96
Voyageurs-----	5	Very limited Depth to saturated zone Slow water movement	1.00  0.22	Very limited Depth to saturated zone Slow water movement	1.00  0.22

# Soil Survey of Voyageurs National Park, Minnesota

Table 10.—Recreation, Part I (Camp and Picnic Areas)—Continued

Map unit symbol and soil name	Pct. of map unit	Camp areas		Picnic areas	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srrn: Foglake-----	5	Very limited Depth to saturated zone Slow water movement	1.00  0.96	Very limited Depth to saturated zone Slow water movement	1.00  0.96
Spooner, till/bedrock substratum-----	5	Very limited Depth to saturated zone Slow water movement	1.00  0.22	Very limited Depth to saturated zone Slow water movement	1.00  0.22
Bootleg-----	5	Very limited Depth to saturated zone Slow water movement	1.00  0.96	Very limited Depth to saturated zone Slow water movement	1.00  0.96
Hassman-----	5	Very limited Depth to saturated zone Ponding Slow water movement	1.00  1.00 0.96	Very limited Ponding Depth to saturated zone Slow water movement	1.00 1.00  0.96
2srrq: Cathro, ponded-----	60	Very limited Depth to saturated zone Ponding Organic matter content Slow water movement	1.00  1.00 1.00 0.22	Very limited Ponding Depth to saturated zone Organic matter content Slow water movement	1.00 1.00  1.00 0.22
Tacoosh, ponded-----	30	Very limited Depth to saturated zone Ponding Organic matter content	1.00  1.00 1.00	Very limited Ponding Depth to saturated zone Organic matter content	1.00 1.00  1.00
Sax, ponded-----	5	Very limited Depth to saturated zone Ponding	1.00  1.00	Very limited Ponding Depth to saturated zone	1.00 1.00
Aquepts, stony, moderately slow Ksat-----	5	Very limited Depth to saturated zone Ponding Slow water movement	1.00  1.00 0.22	Very limited Ponding Depth to saturated zone Slow water movement	1.00 1.00  0.22

# Soil Survey of Voyageurs National Park, Minnesota

Table 10.—Recreation, Part I (Camp and Picnic Areas)—Continued

Map unit symbol and soil name	Pct. of map unit	Camp areas		Picnic areas	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srrr: Insula, very stony, skeletal-----	30	Very limited Depth to bedrock Large stones content Too sandy	1.00 0.77 0.01	Very limited Depth to bedrock Large stones content Too sandy	1.00 0.77 0.01
Voyageurs-----	20	Very limited Depth to saturated zone Slow water movement	1.00 0.22	Very limited Depth to saturated zone Slow water movement	1.00 0.22
Wahlsten, very stony	15	Somewhat limited Gravel content Depth to saturated zone Large stones content	0.51 0.39 0.04	Somewhat limited Gravel content Depth to saturated zone Large stones content	0.51 0.19 0.04
Conic, very stony, skeletal-----	10	Somewhat limited Large stones content	0.35	Somewhat limited Large stones content	0.35
Spooner, till/bedrock substratum-----	8	Very limited Depth to saturated zone Slow water movement	1.00 0.22	Very limited Depth to saturated zone Slow water movement	1.00 0.22
Brickton-----	5	Very limited Depth to saturated zone Slow water movement	1.00 0.96	Very limited Depth to saturated zone Slow water movement	1.00 0.96
Dishno, very stony, skeletal-----	5	Somewhat limited Gravel content Depth to saturated zone Large stones content	0.59 0.39 0.04	Somewhat limited Gravel content Depth to saturated zone Large stones content	0.59 0.19 0.04
Aquepts, very rubbly	3	Very limited Depth to saturated zone Ponding Large stones content	1.00 1.00 1.00	Very limited Large stones content Ponding Depth to saturated zone	1.00 1.00 1.00

# Soil Survey of Voyageurs National Park, Minnesota

Table 10.—Recreation, Part I (Camp and Picnic Areas)—Continued

Map unit symbol and soil name	Pct. of map unit	Camp areas		Picnic areas	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srrr: Aquepts, stony, moderately slow Ksat-----	2	Very limited Depth to saturated zone Ponding Slow water movement	1.00  1.00 0.22	Very limited Ponding Depth to saturated zone Slow water movement	1.00 1.00 0.22
Rock outcrop-----	2	Not rated		Not rated	
2srtr: Bowstring, frequently flooded	50	Very limited Depth to saturated zone Flooding Organic matter content	1.00 1.00 1.00	Very limited Depth to saturated zone Organic matter content Flooding	1.00 1.00 0.40
Fluvaquents, frequently flooded	40	Very limited Depth to saturated zone Flooding	1.00 1.00	Very limited Depth to saturated zone Flooding	1.00 0.40
Cathro, frequently flooded-----	10	Very limited Depth to saturated zone Flooding Organic matter content Slow water movement	1.00 1.00 1.00 0.22	Very limited Depth to saturated zone Organic matter content Flooding Slow water movement	1.00 1.00 0.40 0.22
W: Water-----	100	Not rated		Not rated	



# Soil Survey of Voyageurs National Park, Minnesota

Table 10.—Recreation, Part II (Trail Management)

(Onsite investigation may be needed to validate the interpretations in this table and to confirm the identity of the soil on a given site. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table)

Map unit symbol and soil name	Pct. of map unit	Foot traffic and equestrian trails		Mountain bike and off-road vehicle trails	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srmd: Quetico, bouldery----	35	Not limited		Not limited	
Insula, bouldery----	20	Not limited		Not limited	
Rock outcrop-----	15	Not rated		Not rated	
Wahlsten, bouldery, skeletal-----	10	Somewhat limited Large stones content	0.07	Somewhat limited Large stones content	0.07
Conic, bouldery, skeletal-----	10	Somewhat limited Large stones content	0.07	Somewhat limited Large stones content	0.07
Arcadian, very stony	10	Somewhat limited Large stones content	0.35	Somewhat limited Large stones content	0.35
2srqm: Quetico, bouldery----	40	Somewhat limited Slope	0.82	Not limited	
Insula, bouldery----	25	Somewhat limited Slope	0.82	Not limited	
Rock outcrop-----	15	Not rated		Not rated	
Conic, bouldery, skeletal-----	10	Somewhat limited Large stones content	0.07	Somewhat limited Large stones content	0.07
Arcadian, very stony	10	Somewhat limited Slope Large stones content	0.82 0.35	Somewhat limited Large stones content	0.35
2srqn: Insula, very bouldery, skeletal	35	Somewhat limited Large stones content Slope Too sandy	0.77 0.18 0.01	Somewhat limited Large stones content Too sandy	0.77 0.01
Conic, very bouldery, skeletal	16	Somewhat limited Large stones content	0.35	Somewhat limited Large stones content	0.35

# Soil Survey of Voyageurs National Park, Minnesota

Table 10.—Recreation, Part II (Trail Management)—Continued

Map unit symbol and soil name	Pct. of map unit	Foot traffic and equestrian trails		Mountain bike and off-road vehicle trails	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srqn: Rock outcrop-----	15	Not rated		Not rated	
Metonga, very stony, skeletal----	14	Somewhat limited Large stones content	0.35	Somewhat limited Large stones content	0.35
Quetico, very bouldery, skeletal	10	Somewhat limited Large stones content	0.80	Somewhat limited Large stones content	0.80
		Slope	0.50	Too sandy	0.01
		Too sandy	0.01		
Wahlsten, very stony	5	Somewhat limited Large stones content	0.04	Somewhat limited Large stones content	0.04
Voyageurs-----	3	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
Aquepts, very rubbly	2	Very limited Large stones content	1.00	Very limited Large stones content	1.00
		Depth to saturated zone	1.00	Depth to saturated zone	1.00
		Ponding	1.00	Ponding	1.00
2srqp: Quetico, very bouldery, skeletal	31	Somewhat limited Large stones content Too sandy	0.80 0.01	Somewhat limited Large stones content Too sandy	0.80 0.01
Insula, very bouldery, skeletal	30	Somewhat limited Large stones content	0.77	Somewhat limited Large stones content	0.77
		Too sandy	0.01	Too sandy	0.01
Greenwood-----	15	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
		Organic matter content	1.00	Organic matter content	1.00
Rock outcrop-----	9	Not rated		Not rated	
Merwin-----	5	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
		Organic matter content	1.00	Organic matter content	1.00
		Ponding	1.00	Ponding	1.00

# Soil Survey of Voyageurs National Park, Minnesota

Table 10.—Recreation, Part II (Trail Management)—Continued

Map unit symbol and soil name	Pct. of map unit	Foot traffic and equestrian trails		Mountain bike and off-road vehicle trails	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srqp: Aquepts, very rubbly	5	Very limited Large stones content Depth to saturated zone Ponding	1.00 1.00 1.00	Very limited Large stones content Depth to saturated zone Ponding	1.00 1.00 1.00
Wahlsten, very stony	3	Somewhat limited Large stones content	0.04	Somewhat limited Large stones content	0.04
Conic, very bouldery, skeletal	2	Somewhat limited Large stones content	0.35	Somewhat limited Large stones content	0.35
2srqr: Greenwood-----	80	Very limited Depth to saturated zone Organic matter content	1.00 1.00	Very limited Depth to saturated zone Organic matter content	1.00 1.00
Merwin-----	10	Very limited Depth to saturated zone Organic matter content Ponding	1.00 1.00 1.00	Very limited Depth to saturated zone Organic matter content Ponding	1.00 1.00 1.00
Rifle, moat-----	5	Very limited Depth to saturated zone Organic matter content Ponding	1.00 1.00 1.00	Very limited Depth to saturated zone Organic matter content Ponding	1.00 1.00 1.00
Tacoosh, moat-----	5	Very limited Depth to saturated zone Organic matter content Ponding	1.00 1.00 1.00	Very limited Depth to saturated zone Organic matter content Ponding	1.00 1.00 1.00
2srqs: Insula, very stony, skeletal-----	30	Somewhat limited Large stones content Too sandy	0.77 0.01	Somewhat limited Large stones content Too sandy	0.77 0.01
Conic, very stony, skeletal-----	16	Somewhat limited Large stones content	0.35	Somewhat limited Large stones content	0.35
Wahlsten, very stony	15	Somewhat limited Large stones content	0.04	Somewhat limited Large stones content	0.04

# Soil Survey of Voyageurs National Park, Minnesota

Table 10.—Recreation, Part II (Trail Management)—Continued

Map unit symbol and soil name	Pct. of map unit	Foot traffic and equestrian trails		Mountain bike and off-road vehicle trails	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srqs: Quetico, very stony, skeletal----	10	Somewhat limited Large stones content Too sandy	0.80 0.01	Somewhat limited Large stones content Too sandy	0.80 0.01
Metonga, very stony, skeletal----	9	Somewhat limited Large stones content	0.35	Somewhat limited Large stones content	0.35
Dishno, very stony, skeletal-----	9	Somewhat limited Large stones content	0.04	Somewhat limited Large stones content	0.04
Aquepts, very rubbly	3	Very limited Large stones content Depth to saturated zone Ponding	1.00 1.00 1.00	Very limited Large stones content Depth to saturated zone Ponding	1.00 1.00 1.00
Aquepts, stony, moderately slow Ksat-----	2	Very limited Depth to saturated zone Ponding	1.00 1.00	Very limited Depth to saturated zone Ponding	1.00 1.00
Voyageurs-----	2	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
Rock outcrop-----	2	Not rated		Not rated	
Foglake-----	1	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
Eaglesnest, very stony-----	1	Somewhat limited Large stones content	0.04	Somewhat limited Large stones content	0.04
2srqv: Voyageurs, oxyaquic	35	Not limited		Not limited	
Conic, very stony, skeletal-----	15	Somewhat limited Large stones content	0.35	Somewhat limited Large stones content	0.35
Little Swan-----	20	Somewhat limited Depth to saturated zone	0.44	Somewhat limited Depth to saturated zone	0.44

# Soil Survey of Voyageurs National Park, Minnesota

Table 10.—Recreation, Part II (Trail Management)—Continued

Map unit symbol and soil name	Pct. of map unit	Foot traffic and equestrian trails		Mountain bike and off-road vehicle trails	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srqv: Insula, very stony, skeletal-----	10	Somewhat limited Large stones content Too sandy	0.77 0.01	Somewhat limited Large stones content Too sandy	0.77 0.01
Wahlsten, very stony	5	Somewhat limited Large stones content	0.04	Somewhat limited Large stones content	0.04
Metonga, very stony, skeletal----	5	Somewhat limited Large stones content	0.35	Somewhat limited Large stones content	0.35
Baudette-----	5	Not limited		Not limited	
Aquepts, stony, moderately slow Ksat-----	4	Very limited Depth to saturated zone Ponding	1.00 1.00	Very limited Depth to saturated zone Ponding	1.00 1.00
Rock outcrop-----	1	Not rated		Not rated	
2srqw: Wahlsten, very stony	26	Somewhat limited Large stones content	0.04	Somewhat limited Large stones content	0.04
Spooner-----	24	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
Voyageurs-----	22	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
Insula, very stony, skeletal-----	10	Somewhat limited Large stones content Too sandy	0.77 0.01	Somewhat limited Large stones content Too sandy	0.77 0.01
Dishno, very stony, skeletal-----	9	Somewhat limited Large stones content	0.04	Somewhat limited Large stones content	0.04
Aquepts, stony, moderately slow Ksat-----	3	Very limited Depth to saturated zone Ponding	1.00 1.00	Very limited Depth to saturated zone Ponding	1.00 1.00
Little Swan-----	3	Somewhat limited Depth to saturated zone	0.44	Somewhat limited Depth to saturated zone	0.44

# Soil Survey of Voyageurs National Park, Minnesota

Table 10.—Recreation, Part II (Trail Management)—Continued

Map unit symbol and soil name	Pct. of map unit	Foot traffic and equestrian trails		Mountain bike and off-road vehicle trails	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srqw: Aquepts, very rubbly	2	Very limited Large stones content Depth to saturated zone Ponding	1.00 1.00 1.00	Very limited Large stones content Depth to saturated zone Ponding	1.00 1.00 1.00
Rock outcrop-----	1	Not rated		Not rated	
2srqy: Baudette-----	40	Not limited		Not limited	
Littleswan-----	35	Somewhat limited Depth to saturated zone	0.44	Somewhat limited Depth to saturated zone	0.44
Voyageurs-----	10	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
Wahlsten, very stony	5	Somewhat limited Large stones content	0.04	Somewhat limited Large stones content	0.04
Insula, very stony, skeletal-----	5	Somewhat limited Large stones content Too sandy	0.77 0.01	Somewhat limited Large stones content Too sandy	0.77 0.01
Spooner-----	5	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
2srqz: Canthook-----	30	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
Durkeelake-----	30	Somewhat limited Too sandy	0.08	Somewhat limited Too sandy	0.08
Bootleg-----	10	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
Udipsamments-----	10	Very limited Too sandy	1.00	Very limited Too sandy	1.00
Grytal-----	10	Somewhat limited Too sandy	0.82	Somewhat limited Too sandy	0.82
Voyageurs-----	5	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00



# Soil Survey of Voyageurs National Park, Minnesota

Table 10.—Recreation, Part II (Trail Management)—Continued

Map unit symbol and soil name	Pct. of map unit	Foot traffic and equestrian trails		Mountain bike and off-road vehicle trails	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srqz: Aquepts, stony, moderately slow Ksat-----	5	Very limited Depth to saturated zone Ponding	1.00 1.00	Very limited Depth to saturated zone Ponding	1.00 1.00
2srr3: Spooners-----	40	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
Sax-----	35	Very limited Depth to saturated zone Ponding	1.00 1.00	Very limited Depth to saturated zone Ponding	1.00 1.00
Spooners, till/bedrock substratum-----	5	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
Foglake-----	5	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
Littleswan-----	5	Somewhat limited Depth to saturated zone	0.44	Somewhat limited Depth to saturated zone	0.44
Bootleg-----	5	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
Canthook-----	5	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
2srr4: Littleswan-----	40	Somewhat limited Depth to saturated zone	0.44	Somewhat limited Depth to saturated zone	0.44
Spooners-----	25	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
Voyageurs-----	10	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
Spooners, till/bedrock substratum-----	5	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00

# Soil Survey of Voyageurs National Park, Minnesota

Table 10.—Recreation, Part II (Trail Management)—Continued

Map unit symbol and soil name	Pct. of map unit	Foot traffic and equestrian trails		Mountain bike and off-road vehicle trails	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srr4: Sax-----	5	Very limited Depth to saturated zone Ponding	1.00 1.00	Very limited Depth to saturated zone Ponding	1.00 1.00
Foglake-----	5	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
Bootleg-----	5	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
Canthook-----	5	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
2srr7: Mooselake-----	80	Very limited Depth to saturated zone Organic matter content Ponding	1.00 1.00 1.00	Very limited Depth to saturated zone Organic matter content Ponding	1.00 1.00 1.00
Tacoosh, moat-----	10	Very limited Depth to saturated zone Organic matter content Ponding	1.00 1.00 1.00	Very limited Depth to saturated zone Organic matter content Ponding	1.00 1.00 1.00
Rifle-----	5	Very limited Depth to saturated zone Organic matter content Ponding	1.00 1.00 1.00	Very limited Depth to saturated zone Organic matter content Ponding	1.00 1.00 1.00
Cathro, moat-----	5	Very limited Depth to saturated zone Organic matter content Ponding	1.00 1.00 1.00	Very limited Depth to saturated zone Organic matter content Ponding	1.00 1.00 1.00
2srr8: Rifle-----	80	Very limited Depth to saturated zone Organic matter content Ponding	1.00 1.00 1.00	Very limited Depth to saturated zone Organic matter content Ponding	1.00 1.00 1.00
Tacoosh, moat-----	10	Very limited Depth to saturated zone Organic matter content Ponding	1.00 1.00 1.00	Very limited Depth to saturated zone Organic matter content Ponding	1.00 1.00 1.00

# Soil Survey of Voyageurs National Park, Minnesota

Table 10.—Recreation, Part II (Trail Management)—Continued

Map unit symbol and soil name	Pct. of map unit	Foot traffic and equestrian trails		Mountain bike and off-road vehicle trails	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srr8: Greenwood-----	5	Very limited Depth to saturated zone Organic matter content	1.00  1.00	Very limited Depth to saturated zone Organic matter content	1.00  1.00
Aquepts, stony, moderately slow Ksat-----	5	Very limited Depth to saturated zone Ponding	1.00  1.00	Very limited Depth to saturated zone Ponding	1.00  1.00
2srr9: Tacoosh, frequently flooded-----	40	Very limited Depth to saturated zone Organic matter content Flooding	1.00  1.00  0.40	Very limited Depth to saturated zone Organic matter content Flooding	1.00  1.00  0.40
Sax, frequently flooded-----	35	Very limited Depth to saturated zone Flooding	1.00  0.40	Very limited Depth to saturated zone Flooding	1.00  0.40
Cathro, frequently flooded-----	10	Very limited Depth to saturated zone Organic matter content Flooding	1.00  1.00  0.40	Very limited Depth to saturated zone Organic matter content Flooding	1.00  1.00  0.40
Rifle, frequently flooded-----	10	Very limited Depth to saturated zone Organic matter content Flooding	1.00  1.00  0.40	Very limited Depth to saturated zone Organic matter content Flooding	1.00  1.00  0.40
Hassman, frequently flooded-----	5	Very limited Depth to saturated zone Flooding	1.00  0.40	Very limited Depth to saturated zone Flooding	1.00  0.40
2srrb: Aquepts, ponded-----	30	Very limited Depth to saturated zone Ponding	1.00  1.00	Very limited Depth to saturated zone Ponding	1.00  1.00
Sax, ponded-----	25	Very limited Depth to saturated zone Ponding	1.00  1.00	Very limited Depth to saturated zone Ponding	1.00  1.00

Soil Survey of Voyageurs National Park, Minnesota

Table 10.—Recreation, Part II (Trail Management)—Continued

Map unit symbol and soil name	Pct. of map unit	Foot traffic and equestrian trails		Mountain bike and off-road vehicle trails	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srrb: Tacoosh, ponded-----	25	Very limited Depth to saturated zone Organic matter content Ponding	1.00 1.00 1.00 1.00	Very limited Depth to saturated zone Organic matter content Ponding	1.00 1.00 1.00 1.00
Rifle, ponded-----	10	Very limited Depth to saturated zone Organic matter content Ponding	1.00 1.00 1.00	Very limited Depth to saturated zone Organic matter content Ponding	1.00 1.00 1.00
Hassman, ponded-----	10	Very limited Depth to saturated zone Ponding	1.00 1.00	Very limited Depth to saturated zone Ponding	1.00 1.00
2srrh: Greenwood, seasonally ponded--	80	Very limited Depth to saturated zone Organic matter content Ponding	1.00 1.00 1.00	Very limited Depth to saturated zone Organic matter content Ponding	1.00 1.00 1.00
Merwin, seasonally ponded-----	10	Very limited Depth to saturated zone Organic matter content Ponding	1.00 1.00 1.00	Very limited Depth to saturated zone Organic matter content Ponding	1.00 1.00 1.00
Rifle, seasonally ponded-----	5	Very limited Depth to saturated zone Organic matter content Ponding	1.00 1.00 1.00	Very limited Depth to saturated zone Organic matter content Ponding	1.00 1.00 1.00
Tacoosh, seasonally ponded-----	5	Very limited Depth to saturated zone Organic matter content Ponding	1.00 1.00 1.00	Very limited Depth to saturated zone Organic matter content Ponding	1.00 1.00 1.00
2srrj: Rifle, seasonally ponded-----	80	Very limited Depth to saturated zone Organic matter content Ponding	1.00 1.00 1.00	Very limited Depth to saturated zone Organic matter content Ponding	1.00 1.00 1.00

# Soil Survey of Voyageurs National Park, Minnesota

Table 10.—Recreation, Part II (Trail Management)—Continued

Map unit symbol and soil name	Pct. of map unit	Foot traffic and equestrian trails		Mountain bike and off-road vehicle trails	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srrj: Tacoosh, seasonally ponded-----	10	Very limited Depth to saturated zone Organic matter content Ponding	1.00 1.00 1.00	Very limited Depth to saturated zone Organic matter content Ponding	1.00 1.00 1.00
Greenwood, seasonally ponded--	5	Very limited Depth to saturated zone Organic matter content Ponding	1.00 1.00 1.00	Very limited Depth to saturated zone Organic matter content Ponding	1.00 1.00 1.00
Aquepts, stony, moderately slow Ksat-----	5	Very limited Depth to saturated zone Ponding	1.00 1.00	Very limited Depth to saturated zone Ponding	1.00 1.00
2srrk: Insula, very stony, skeletal-----	30	Somewhat limited Large stones content Slope Too sandy	0.77 0.02 0.01	Somewhat limited Large stones content Too sandy	0.77 0.01
Conic, very stony, skeletal-----	16	Somewhat limited Large stones content	0.35	Somewhat limited Large stones content	0.35
Wahlsten, very stony	15	Somewhat limited Large stones content	0.04	Somewhat limited Large stones content	0.04
Quetico, very stony, skeletal----	10	Somewhat limited Large stones content Slope Too sandy	0.80 0.02 0.01	Somewhat limited Large stones content Too sandy	0.80 0.01
Metonga, very stony, skeletal----	9	Somewhat limited Large stones content	0.35	Somewhat limited Large stones content	0.35
Dishno, very stony, skeletal-----	9	Somewhat limited Large stones content	0.04	Somewhat limited Large stones content	0.04

# Soil Survey of Voyageurs National Park, Minnesota

Table 10.—Recreation, Part II (Trail Management)—Continued

Map unit symbol and soil name	Pct. of map unit	Foot traffic and equestrian trails		Mountain bike and off-road vehicle trails	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srrk: Aquepts, very rubbly	3	Very limited Large stones content Depth to saturated zone Ponding	1.00 1.00 1.00	Very limited Large stones content Depth to saturated zone Ponding	1.00 1.00 1.00
Aquepts, stony, moderately slow Ksat-----	2	Very limited Depth to saturated zone Ponding	1.00 1.00	Very limited Depth to saturated zone Ponding	1.00 1.00
Voyageurs-----	2	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
Rock outcrop-----	2	Not rated		Not rated	
Foglake-----	1	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
Eaglesnest, very stony-----	1	Somewhat limited Large stones content	0.04	Somewhat limited Large stones content	0.04
2srrl: Tacoosh, occasionally flooded-----	40	Very limited Depth to saturated zone Organic matter content	1.00 1.00	Very limited Depth to saturated zone Organic matter content	1.00 1.00
Sax, occasionally flooded-----	35	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
Cathro, occasionally flooded-----	10	Very limited Depth to saturated zone Organic matter content	1.00 1.00	Very limited Depth to saturated zone Organic matter content	1.00 1.00
Rifle, occasionally flooded-----	10	Very limited Depth to saturated zone Organic matter content	1.00 1.00	Very limited Depth to saturated zone Organic matter content	1.00 1.00



# Soil Survey of Voyageurs National Park, Minnesota

Table 10.—Recreation, Part II (Trail Management)—Continued

Map unit symbol and soil name	Pct. of map unit	Foot traffic and equestrian trails		Mountain bike and off-road vehicle trails	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srrl: Hassman, occasionally flooded-----	5	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
2srrm: Brickton-----	40	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
Hassman-----	35	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
		Ponding	1.00	Ponding	1.00
Spooner, till/bedrock substratum-----	5	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
Foglake-----	5	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
Dalbo-----	5	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
Bootleg-----	5	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
Tacoosh-----	5	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
		Organic matter content	1.00	Organic matter content	1.00
		Ponding	1.00	Ponding	1.00
2srrn: Brickton-----	60	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
Dalbo-----	15	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
Voyageurs-----	5	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
Foglake-----	5	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00

Soil Survey of Voyageurs National Park, Minnesota

Table 10.--Recreation, Part II (Trail Management)--Continued

Map unit symbol and soil name	Pct. of map unit	Foot traffic and equestrian trails		Mountain bike and off-road vehicle trails	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srrn: Spooner, till/bedrock substratum-----	5	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
Bootleg-----	5	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
Hassman-----	5	Very limited Depth to saturated zone Ponding	1.00 1.00	Very limited Depth to saturated zone Ponding	1.00 1.00
2srrq: Cathro, ponded-----	60	Very limited Depth to saturated zone Organic matter content Ponding	1.00 1.00 1.00	Very limited Depth to saturated zone Organic matter content Ponding	1.00 1.00 1.00
Tacoosh, ponded-----	30	Very limited Depth to saturated zone Organic matter content Ponding	1.00 1.00 1.00	Very limited Depth to saturated zone Organic matter content Ponding	1.00 1.00 1.00
Sax, ponded-----	5	Very limited Depth to saturated zone Ponding	1.00 1.00	Very limited Depth to saturated zone Ponding	1.00 1.00
Aquepts, stony, moderately slow Ksat-----	5	Very limited Depth to saturated zone Ponding	1.00 1.00	Very limited Depth to saturated zone Ponding	1.00 1.00
2srrr: Insula, very stony, skeletal-----	30	Somewhat limited Large stones content Too sandy	0.77 0.01	Somewhat limited Large stones content Too sandy	0.77 0.01
Voyageurs-----	20	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
Wahlsten, very stony	15	Somewhat limited Large stones content	0.04	Somewhat limited Large stones content	0.04
Conic, very stony, skeletal-----	10	Somewhat limited Large stones content	0.35	Somewhat limited Large stones content	0.35

# Soil Survey of Voyageurs National Park, Minnesota

Table 10.—Recreation, Part II (Trail Management)—Continued

Map unit symbol and soil name	Pct. of map unit	Foot traffic and equestrian trails		Mountain bike and off-road vehicle trails	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srrr: Spoooner, till/bedrock substratum-----	8	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
Brickton-----	5	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone	1.00
Dishno, very stony, skeletal-----	5	Somewhat limited Large stones content	0.04	Somewhat limited Large stones content	0.04
Aquepts, very rubbly	3	Very limited Large stones content Depth to saturated zone Ponding	1.00 1.00 1.00	Very limited Large stones content Depth to saturated zone Ponding	1.00 1.00 1.00
Aquepts, stony, moderately slow Ksat-----	2	Very limited Depth to saturated zone Ponding	1.00 1.00	Very limited Depth to saturated zone Ponding	1.00 1.00
Rock outcrop-----	2	Not rated		Not rated	
2srtr: Bowstring, frequently flooded	50	Very limited Depth to saturated zone Organic matter content Flooding	1.00 1.00 0.40	Very limited Depth to saturated zone Organic matter content Flooding	1.00 1.00 0.40
Fluvaquents, frequently flooded	40	Very limited Depth to saturated zone Flooding	1.00 0.40	Very limited Depth to saturated zone Flooding	1.00 0.40
Cathro, frequently flooded-----	10	Very limited Depth to saturated zone Organic matter content Flooding	1.00 1.00 0.40	Very limited Depth to saturated zone Organic matter content Flooding	1.00 1.00 0.40
W: Water-----	100	Not rated		Not rated	

# Soil Survey of Voyageurs National Park, Minnesota

Table 11.--Dwellings and Small Commercial Buildings

(Onsite investigation may be needed to validate the interpretations in this table and to confirm the identity of the soil on a given site. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table)

Map unit symbol and soil name	Pct. of map unit	Dwellings without basements		Dwellings with basements		Small commercial buildings	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srmd: Quetico, bouldery---	35	Very limited Depth to hard bedrock Slope	1.00  0.16	Very limited Depth to hard bedrock Slope	1.00  0.16	Very limited Depth to hard bedrock Slope	1.00  1.00
Insula, bouldery----	20	Very limited Depth to hard bedrock Slope	1.00  0.16	Very limited Depth to hard bedrock Slope	1.00  0.16	Very limited Depth to hard bedrock Slope	1.00  1.00
Rock outcrop-----	15	Not rated		Not rated		Not rated	
Wahlsten, bouldery, skeletal-----	10	Somewhat limited Depth to saturated zone Depth to hard bedrock Large stones	0.39  0.10  0.01	Very limited Depth to saturated zone Depth to hard bedrock Large stones	1.00  1.00  0.01	Somewhat limited Depth to saturated zone Depth to hard bedrock Slope Large stones	0.39  0.10  0.01 0.01
Conic, bouldery, skeletal-----	10	Somewhat limited Depth to hard bedrock Slope Large stones	0.93  0.16 0.08	Very limited Depth to hard bedrock Slope Large stones	1.00  0.16 0.08	Very limited Slope Depth to hard bedrock Large stones	1.00  0.93  0.08
Arcadian, very stony	10	Very limited Depth to hard bedrock Slope	1.00  1.00	Very limited Depth to hard bedrock Slope	1.00  1.00	Very limited Depth to hard bedrock Slope	1.00  1.00
2srqm: Quetico, bouldery---	40	Very limited Depth to hard bedrock Slope	1.00  1.00	Very limited Depth to hard bedrock Slope	1.00  1.00	Very limited Slope Depth to hard bedrock	1.00  1.00
Insula, bouldery----	25	Very limited Depth to hard bedrock Slope	1.00  1.00	Very limited Depth to hard bedrock Slope	1.00  1.00	Very limited Slope Depth to hard bedrock	1.00  1.00
Rock outcrop-----	15	Not rated		Not rated		Not rated	
Conic, bouldery, skeletal-----	10	Somewhat limited Depth to hard bedrock Slope Large stones	0.93  0.16 0.08	Very limited Depth to hard bedrock Slope Large stones	1.00  0.16 0.08	Very limited Slope Depth to hard bedrock Large stones	1.00  0.93  0.08

# Soil Survey of Voyageurs National Park, Minnesota

Table 11.--Dwellings and Small Commercial Buildings--Continued

Map unit symbol and soil name	Pct. of map unit	Dwellings without basements		Dwellings with basements		Small commercial buildings	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srqm: Arcadian, very stony	10	Very limited Depth to hard bedrock Slope	1.00  1.00	Very limited Depth to hard bedrock Slope	1.00  1.00	Very limited Depth to hard bedrock Slope	1.00  1.00
2srqn: Insula, very bouldery, skeletal	35	Very limited Depth to hard bedrock Slope Large stones	1.00  1.00 1.00	Very limited Depth to hard bedrock Slope Large stones	1.00  1.00 1.00	Very limited Slope Depth to hard bedrock Large stones	1.00  1.00 1.00
Conic, very bouldery, skeletal	16	Very limited Slope Depth to hard bedrock Large stones	1.00  0.88 0.61	Very limited Depth to hard bedrock Slope Large stones	1.00  1.00 0.61	Very limited Slope Depth to hard bedrock Large stones	1.00  0.88 0.61
Rock outcrop-----	15	Not rated		Not rated		Not rated	
Metonga, very stony, skeletal----	14	Somewhat limited Depth to hard bedrock Large stones	0.90  0.10	Very limited Depth to hard bedrock Large stones	1.00  0.10	Very limited Slope Depth to hard bedrock Large stones	1.00  0.90 0.10
Quetico, very bouldery, skeletal	10	Very limited Depth to hard bedrock Slope Large stones	1.00  1.00 1.00	Very limited Depth to hard bedrock Slope Large stones	1.00  1.00 1.00	Very limited Slope Depth to hard bedrock Large stones	1.00  1.00 1.00
Wahlsten, very stony	5	Somewhat limited Depth to saturated zone Depth to hard bedrock	0.39  0.38	Very limited Depth to saturated zone Depth to hard bedrock	1.00  1.00	Somewhat limited Depth to saturated zone Depth to hard bedrock Slope	0.39  0.38 0.01
Voyageurs-----	3	Very limited Depth to saturated zone Shrink-swell	1.00  0.11	Very limited Depth to saturated zone Depth to hard bedrock	1.00  0.08	Very limited Depth to saturated zone Shrink-swell	1.00  0.11
Aquepts, very rubbly	2	Very limited Ponding Depth to saturated zone Large stones	1.00  1.00 0.89	Very limited Ponding Depth to saturated zone Large stones	1.00  1.00 0.89	Very limited Ponding Depth to saturated zone Large stones	1.00  1.00 0.89

# Soil Survey of Voyageurs National Park, Minnesota

Table 11.—Dwellings and Small Commercial Buildings—Continued

Map unit symbol and soil name	Pct. of map unit	Dwellings without basements		Dwellings with basements		Small commercial buildings	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srqp: Quetico, very bouldery, skeletal	31	Very limited Depth to hard bedrock Large stones Slope	1.00 1.00 0.16	Very limited Depth to hard bedrock Large stones Slope	1.00 1.00 0.16	Very limited Depth to hard bedrock Slope Large stones	1.00 1.00 1.00
Insula, very bouldery, skeletal	30	Very limited Depth to hard bedrock Large stones	1.00 1.00	Very limited Depth to hard bedrock Large stones	1.00 1.00	Very limited Depth to hard bedrock Slope Large stones	1.00 1.00 1.00
Greenwood-----	15	Very limited Subsidence Depth to saturated zone Organic matter content	1.00 1.00 1.00	Very limited Subsidence Depth to saturated zone Organic matter content	1.00 1.00 1.00	Very limited Subsidence Depth to saturated zone Organic matter content	1.00 1.00 1.00
Rock outcrop-----	9	Not rated		Not rated		Not rated	
Merwin-----	5	Very limited Ponding Depth to saturated zone Subsidence	1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Subsidence	1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Subsidence	1.00 1.00 1.00
Aquepts, very rubbly	5	Very limited Ponding Depth to saturated zone Large stones	1.00 1.00 0.89	Very limited Ponding Depth to saturated zone Large stones	1.00 1.00 0.89	Very limited Ponding Depth to saturated zone Large stones	1.00 1.00 0.89
Wahlsten, very stony	3	Somewhat limited Depth to saturated zone Depth to hard bedrock	0.39 0.38	Very limited Depth to saturated zone Depth to hard bedrock	1.00 1.00	Somewhat limited Depth to saturated zone Depth to hard bedrock Slope	0.39 0.38 0.01
Conic, very bouldery, skeletal	2	Somewhat limited Depth to hard bedrock Large stones Slope	0.88 0.61 0.16	Very limited Depth to hard bedrock Large stones Slope	1.00 0.61 0.16	Very limited Slope Depth to hard bedrock Large stones	1.00 0.88 0.61
2srqr: Greenwood-----	80	Very limited Subsidence Depth to saturated zone Organic matter content	1.00 1.00 1.00	Very limited Subsidence Depth to saturated zone Organic matter content	1.00 1.00 1.00	Very limited Subsidence Depth to saturated zone Organic matter content	1.00 1.00 1.00



# Soil Survey of Voyageurs National Park, Minnesota

Table 11.—Dwellings and Small Commercial Buildings—Continued

Map unit symbol and soil name	Pct. of map unit	Dwellings without basements		Dwellings with basements		Small commercial buildings	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srqr: Merwin-----	10	Very limited Ponding Depth to saturated zone Subsidence	1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Subsidence	1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Subsidence	1.00 1.00 1.00
Rifle, moat-----	5	Very limited Ponding Subsidence Depth to saturated zone Organic matter content	1.00 1.00 1.00 1.00	Very limited Ponding Subsidence Depth to saturated zone	1.00 1.00 1.00	Very limited Ponding Subsidence Depth to saturated zone Organic matter content	1.00 1.00 1.00 1.00
Tacoosh, moat-----	5	Very limited Ponding Depth to saturated zone Organic matter content Subsidence	1.00 1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Subsidence	1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Organic matter content Subsidence	1.00 1.00 1.00 1.00
2srqs: Insula, very stony, skeletal-----	30	Very limited Depth to hard bedrock Large stones Slope	1.00 1.00 0.16	Very limited Depth to hard bedrock Large stones Slope	1.00 1.00 0.16	Very limited Depth to hard bedrock Slope Large stones	1.00 1.00 1.00
Conic, very stony, skeletal-----	16	Somewhat limited Depth to hard bedrock Large stones	0.88 0.61	Very limited Depth to hard bedrock Large stones	1.00 0.61	Very limited Slope Depth to hard bedrock Large stones	1.00 0.88 0.61
Wahlsten, very stony	15	Somewhat limited Depth to saturated zone Depth to hard bedrock	0.39 0.38	Very limited Depth to saturated zone Depth to hard bedrock	1.00 1.00	Somewhat limited Depth to saturated zone Depth to hard bedrock Slope	0.39 0.38 0.01
Quetico, very stony, skeletal----	10	Very limited Depth to hard bedrock Large stones Slope	1.00 1.00 0.16	Very limited Depth to hard bedrock Large stones Slope	1.00 1.00 0.16	Very limited Depth to hard bedrock Slope Large stones	1.00 1.00 1.00
Metonga, very stony, skeletal----	9	Somewhat limited Depth to hard bedrock Large stones	0.90 0.10	Very limited Depth to hard bedrock Large stones	1.00 0.10	Very limited Slope Depth to hard bedrock Large stones	1.00 0.90 0.10

# Soil Survey of Voyageurs National Park, Minnesota

Table 11.—Dwellings and Small Commercial Buildings—Continued

Map unit symbol and soil name	Pct. of map unit	Dwellings without basements		Dwellings with basements		Small commercial buildings	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srqs: Dishno, very stony, skeletal-----	9	Somewhat limited Depth to saturated zone	0.39	Very limited Depth to saturated zone Depth to hard bedrock	1.00 0.50	Somewhat limited Depth to saturated zone Slope	0.39 0.14
Aquepts, very rubbly	3	Very limited Ponding Depth to saturated zone Large stones	1.00 1.00 0.89	Very limited Ponding Depth to saturated zone Large stones	1.00 1.00 0.89	Very limited Ponding Depth to saturated zone Large stones	1.00 1.00 0.89
Aquepts, stony, moderately slow Ksat-----	2	Very limited Ponding Depth to saturated zone	1.00 1.00	Very limited Ponding Depth to saturated zone	1.00 1.00	Very limited Ponding Depth to saturated zone	1.00 1.00
Voyageurs-----	2	Very limited Depth to saturated zone Shrink-swell	1.00 0.11	Very limited Depth to saturated zone Depth to hard bedrock	1.00 0.08	Very limited Depth to saturated zone Shrink-swell	1.00 0.11
Rock outcrop-----	2	Not rated		Not rated		Not rated	
Foglake-----	1	Very limited Depth to saturated zone Shrink-swell	1.00 1.00	Very limited Depth to saturated zone Shrink-swell	1.00 0.70	Very limited Depth to saturated zone Shrink-swell	1.00 1.00
Eaglesnest, very stony-----	1	Somewhat limited Depth to saturated zone	0.39	Very limited Depth to saturated zone	1.00	Very limited Slope Depth to saturated zone	1.00 0.39
2srqv: Voyageurs, oxyaquic	35	Not limited		Very limited Depth to saturated zone Depth to hard bedrock	1.00 0.32	Somewhat limited Slope	0.01
Conic, very stony, skeletal-----	15	Somewhat limited Depth to hard bedrock Large stones	0.88 0.61	Very limited Depth to hard bedrock Large stones	1.00 0.61	Very limited Slope Depth to hard bedrock Large stones	1.00 0.88 0.61
Littleswan-----	20	Somewhat limited Depth to saturated zone	0.98	Very limited Depth to saturated zone Shrink-swell	1.00 0.01	Somewhat limited Depth to saturated zone	0.98

# Soil Survey of Voyageurs National Park, Minnesota

Table 11.—Dwellings and Small Commercial Buildings—Continued

Map unit symbol and soil name	Pct. of map unit	Dwellings without basements		Dwellings with basements		Small commercial buildings	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srqv: Insula, very stony, skeletal-----	10	Very limited Depth to hard bedrock Large stones Slope	1.00 1.00 0.16	Very limited Depth to hard bedrock Large stones Slope	1.00 1.00 0.16	Very limited Depth to hard bedrock Slope Large stones	1.00 1.00 1.00
Wahlsten, very stony	5	Somewhat limited Depth to saturated zone Depth to hard bedrock	0.39 0.38	Very limited Depth to saturated zone Depth to hard bedrock	1.00 1.00	Somewhat limited Depth to saturated zone Depth to hard bedrock Slope	0.39 0.38 0.01
Metonga, very stony, skeletal----	5	Somewhat limited Depth to hard bedrock Large stones	0.90 0.10	Very limited Depth to hard bedrock Large stones	1.00 0.10	Very limited Slope Depth to hard bedrock Large stones	1.00 0.90 0.10
Baudette-----	5	Somewhat limited Shrink-swell	0.02	Very limited Depth to saturated zone	1.00	Somewhat limited Shrink-swell	0.02
Aquepts, stony, moderately slow Ksat-----	4	Very limited Ponding Depth to saturated zone	1.00 1.00	Very limited Ponding Depth to saturated zone	1.00 1.00	Very limited Ponding Depth to saturated zone	1.00 1.00
Rock outcrop-----	1	Not rated		Not rated		Not rated	
2srqw: Wahlsten, very stony	26	Somewhat limited Depth to saturated zone Depth to hard bedrock	0.39 0.38	Very limited Depth to saturated zone Depth to hard bedrock	1.00 1.00	Somewhat limited Depth to saturated zone Depth to hard bedrock Slope	0.39 0.38 0.01
Spooner-----	24	Very limited Depth to saturated zone Shrink-swell	1.00 0.04	Very limited Depth to saturated zone Shrink-swell	1.00 0.02	Very limited Depth to saturated zone Shrink-swell	1.00 0.04
Voyageurs-----	22	Very limited Depth to saturated zone Shrink-swell	1.00 0.11	Very limited Depth to saturated zone Depth to hard bedrock	1.00 0.08	Very limited Depth to saturated zone Shrink-swell	1.00 0.11
Insula, very stony, skeletal-----	10	Very limited Depth to hard bedrock Large stones	1.00 1.00	Very limited Depth to hard bedrock Large stones	1.00 1.00	Very limited Depth to hard bedrock Large stones Slope	1.00 1.00 0.14

# Soil Survey of Voyageurs National Park, Minnesota

Table 11.—Dwellings and Small Commercial Buildings—Continued

Map unit symbol and soil name	Pct. of map unit	Dwellings without basements		Dwellings with basements		Small commercial buildings	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srqw: Dishno, very stony, skeletal-----	9	Somewhat limited Depth to saturated zone	0.39	Very limited Depth to saturated zone Depth to hard bedrock	1.00 0.50	Somewhat limited Depth to saturated zone Slope	0.39 0.14
Aquepts, stony, moderately slow Ksat-----	3	Very limited Ponding Depth to saturated zone	1.00 1.00	Very limited Ponding Depth to saturated zone	1.00 1.00	Very limited Ponding Depth to saturated zone	1.00 1.00
Little Swan-----	3	Somewhat limited Depth to saturated zone	0.98	Very limited Depth to saturated zone Shrink-swell	1.00 0.01	Somewhat limited Depth to saturated zone	0.98
Aquepts, very rubbly	2	Very limited Ponding Depth to saturated zone Large stones	1.00 1.00 0.89	Very limited Ponding Depth to saturated zone Large stones	1.00 1.00 0.89	Very limited Ponding Depth to saturated zone Large stones	1.00 1.00 0.89
Rock outcrop-----	1	Not rated		Not rated		Not rated	
2srqy: Baudette-----	40	Somewhat limited Shrink-swell	0.02	Very limited Depth to saturated zone	1.00	Somewhat limited Shrink-swell Slope	0.02 0.01
Little Swan-----	35	Somewhat limited Depth to saturated zone	0.98	Very limited Depth to saturated zone Shrink-swell	1.00 0.01	Somewhat limited Depth to saturated zone	0.98
Voyageurs-----	10	Very limited Depth to saturated zone Shrink-swell	1.00 0.11	Very limited Depth to saturated zone Depth to hard bedrock	1.00 0.08	Very limited Depth to saturated zone Shrink-swell	1.00 0.11
Wahlsten, very stony	5	Somewhat limited Depth to saturated zone Depth to hard bedrock	0.39 0.38	Very limited Depth to saturated zone Depth to hard bedrock	1.00 1.00	Somewhat limited Depth to saturated zone Depth to hard bedrock Slope	0.39 0.38 0.01
Insula, very stony, skeletal-----	5	Very limited Depth to hard bedrock Large stones	1.00 1.00	Very limited Depth to hard bedrock Large stones	1.00 1.00	Very limited Depth to hard bedrock Large stones Slope	1.00 1.00 0.52
Spooner-----	5	Very limited Depth to saturated zone Shrink-swell	1.00 0.04	Very limited Depth to saturated zone Shrink-swell	1.00 0.02	Very limited Depth to saturated zone Shrink-swell	1.00 0.04

# Soil Survey of Voyageurs National Park, Minnesota

Table 11.—Dwellings and Small Commercial Buildings—Continued

Map unit symbol and soil name	Pct. of map unit	Dwellings without basements		Dwellings with basements		Small commercial buildings	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srqz: Canthook-----	30	Very limited Depth to saturated zone Shrink-swell	1.00 0.58	Very limited Depth to saturated zone Shrink-swell	1.00 0.79	Very limited Depth to saturated zone Shrink-swell Slope	1.00 0.58 0.01
Durkeelake-----	30	Somewhat limited Depth to saturated zone	0.44	Very limited Depth to saturated zone	1.00	Very limited Slope Depth to saturated zone	1.00 0.44
Bootleg-----	10	Very limited Depth to saturated zone Shrink-swell	1.00 0.56	Very limited Depth to saturated zone Shrink-swell	1.00 0.82	Very limited Depth to saturated zone Shrink-swell	1.00 0.56
Udipsamments-----	10	Not limited		Not limited		Very limited Slope	1.00
Grytal-----	10	Not limited		Very limited Depth to saturated zone	1.00	Not limited	
Voyageurs-----	5	Very limited Depth to saturated zone Shrink-swell	1.00 0.11	Very limited Depth to saturated zone Depth to hard bedrock	1.00 0.08	Very limited Depth to saturated zone Shrink-swell	1.00 0.11
Aquepts, stony, moderately slow Ksat-----	5	Very limited Ponding Depth to saturated zone	1.00 1.00	Very limited Ponding Depth to saturated zone	1.00 1.00	Very limited Ponding Depth to saturated zone	1.00 1.00
2srr3: Spooners-----	40	Very limited Depth to saturated zone Shrink-swell	1.00 0.04	Very limited Depth to saturated zone Shrink-swell	1.00 0.02	Very limited Depth to saturated zone Shrink-swell	1.00 0.04
Sax-----	35	Very limited Ponding Depth to saturated zone	1.00 1.00	Very limited Ponding Depth to saturated zone	1.00 1.00	Very limited Ponding Depth to saturated zone	1.00 1.00
Spooners, till/bedrock substratum-----	5	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone Depth to hard bedrock	1.00 0.99	Very limited Depth to saturated zone	1.00
Foglake-----	5	Very limited Depth to saturated zone Shrink-swell	1.00 1.00	Very limited Depth to saturated zone Shrink-swell	1.00 0.70	Very limited Depth to saturated zone Shrink-swell	1.00 1.00

# Soil Survey of Voyageurs National Park, Minnesota

Table 11.—Dwellings and Small Commercial Buildings—Continued

Map unit symbol and soil name	Pct. of map unit	Dwellings without basements		Dwellings with basements		Small commercial buildings	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srr3: Littleswan-----	5	Somewhat limited Depth to saturated zone	0.98	Very limited Depth to saturated zone Shrink-swell	1.00 0.01	Somewhat limited Depth to saturated zone	0.98
Bootleg-----	5	Very limited Depth to saturated zone Shrink-swell	1.00 0.56	Very limited Depth to saturated zone Shrink-swell	1.00 0.82	Very limited Depth to saturated zone Shrink-swell	1.00 0.56
Canthook-----	5	Very limited Depth to saturated zone Shrink-swell	1.00 0.58	Very limited Depth to saturated zone Shrink-swell	1.00 0.79	Very limited Depth to saturated zone Shrink-swell	1.00 0.58
2srr4: Littleswan-----	40	Somewhat limited Depth to saturated zone	0.98	Very limited Depth to saturated zone Shrink-swell	1.00 0.01	Somewhat limited Depth to saturated zone	0.98
Spooner-----	25	Very limited Depth to saturated zone Shrink-swell	1.00 0.04	Very limited Depth to saturated zone Shrink-swell	1.00 0.02	Very limited Depth to saturated zone Shrink-swell	1.00 0.04
Voyageurs-----	10	Very limited Depth to saturated zone Shrink-swell	1.00 0.11	Very limited Depth to saturated zone Depth to hard bedrock	1.00 0.08	Very limited Depth to saturated zone Shrink-swell	1.00 0.11
Spooner, till/bedrock substratum-----	5	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone Depth to hard bedrock	1.00 0.99	Very limited Depth to saturated zone	1.00
Sax-----	5	Very limited Ponding Depth to saturated zone	1.00 1.00	Very limited Ponding Depth to saturated zone	1.00 1.00	Very limited Ponding Depth to saturated zone	1.00 1.00
Foglake-----	5	Very limited Depth to saturated zone Shrink-swell	1.00 1.00	Very limited Depth to saturated zone Shrink-swell	1.00 0.70	Very limited Depth to saturated zone Shrink-swell	1.00 1.00
Bootleg-----	5	Very limited Depth to saturated zone Shrink-swell	1.00 0.56	Very limited Depth to saturated zone Shrink-swell	1.00 0.82	Very limited Depth to saturated zone Shrink-swell	1.00 0.56
Canthook-----	5	Very limited Depth to saturated zone Shrink-swell	1.00 0.58	Very limited Depth to saturated zone Shrink-swell	1.00 0.79	Very limited Depth to saturated zone Shrink-swell	1.00 0.58



Soil Survey of Voyageurs National Park, Minnesota

Table 11.—Dwellings and Small Commercial Buildings—Continued

Map unit symbol and soil name	Pct. of map unit	Dwellings without basements		Dwellings with basements		Small commercial buildings	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srr7: Mooselake-----	80	Very limited Ponding Subsidence Depth to saturated zone Organic matter content	1.00 1.00 1.00 1.00	Very limited Ponding Subsidence Depth to saturated zone Organic matter content	1.00 1.00 1.00 1.00	Very limited Ponding Subsidence Depth to saturated zone Organic matter content	1.00 1.00 1.00 1.00
Tacoosh, moat-----	10	Very limited Ponding Depth to saturated zone Organic matter content Subsidence	1.00 1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Subsidence	1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Organic matter content Subsidence	1.00 1.00 1.00
Rifle-----	5	Very limited Ponding Subsidence Depth to saturated zone Organic matter content	1.00 1.00 1.00 1.00	Very limited Ponding Subsidence Depth to saturated zone Organic matter content	1.00 1.00 1.00 1.00	Very limited Ponding Subsidence Depth to saturated zone Organic matter content	1.00 1.00 1.00 1.00
Cathro, moat-----	5	Very limited Ponding Depth to saturated zone Subsidence	1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Subsidence	1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Subsidence	1.00 1.00 1.00
2srr8: Rifle-----	80	Very limited Ponding Subsidence Depth to saturated zone Organic matter content	1.00 1.00 1.00 1.00	Very limited Ponding Subsidence Depth to saturated zone Organic matter content	1.00 1.00 1.00 1.00	Very limited Ponding Subsidence Depth to saturated zone Organic matter content	1.00 1.00 1.00 1.00
Tacoosh, moat-----	10	Very limited Ponding Depth to saturated zone Organic matter content Subsidence	1.00 1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Subsidence	1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Organic matter content Subsidence	1.00 1.00 1.00
Greenwood-----	5	Very limited Subsidence Depth to saturated zone Organic matter content	1.00 1.00 1.00	Very limited Subsidence Depth to saturated zone Organic matter content	1.00 1.00 1.00	Very limited Subsidence Depth to saturated zone Organic matter content	1.00 1.00 1.00
Aquepts, stony, moderately slow Ksat-----	5	Very limited Ponding Depth to saturated zone	1.00 1.00	Very limited Ponding Depth to saturated zone	1.00 1.00	Very limited Ponding Depth to saturated zone	1.00 1.00

# Soil Survey of Voyageurs National Park, Minnesota

Table 11.—Dwellings and Small Commercial Buildings—Continued

Map unit symbol and soil name	Pct. of map unit	Dwellings without basements		Dwellings with basements		Small commercial buildings	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srr9: Tacoosh, frequently flooded-----	40	Very limited Flooding Depth to saturated zone Organic matter content Subsidence	1.00 1.00 1.00 1.00	Very limited Flooding Depth to saturated zone Subsidence	1.00 1.00 1.00	Very limited Flooding Depth to saturated zone Organic matter content Subsidence	1.00 1.00 1.00 1.00
Sax, frequently flooded-----	35	Very limited Flooding Depth to saturated zone	1.00 1.00	Very limited Flooding Depth to saturated zone	1.00 1.00	Very limited Flooding Depth to saturated zone	1.00 1.00
Cathro, frequently flooded-----	10	Very limited Flooding Depth to saturated zone Subsidence	1.00 1.00 1.00	Very limited Flooding Depth to saturated zone Subsidence	1.00 1.00 1.00	Very limited Flooding Depth to saturated zone Subsidence	1.00 1.00 1.00
Rifle, frequently flooded-----	10	Very limited Subsidence Flooding Depth to saturated zone Organic matter content	1.00 1.00 1.00 1.00	Very limited Subsidence Flooding Depth to saturated zone	1.00 1.00 1.00	Very limited Subsidence Flooding Depth to saturated zone Organic matter content	1.00 1.00 1.00 1.00
Hassman, frequently flooded-----	5	Very limited Flooding Depth to saturated zone Shrink-swell	1.00 1.00 1.00	Very limited Flooding Depth to saturated zone Shrink-swell	1.00 1.00 1.00	Very limited Flooding Depth to saturated zone Shrink-swell	1.00 1.00 1.00
2srrb: Aguents, ponded-----	30	Very limited Ponding Depth to saturated zone	1.00 1.00	Very limited Ponding Depth to saturated zone	1.00 1.00	Very limited Ponding Depth to saturated zone	1.00 1.00
Sax, ponded-----	25	Very limited Ponding Depth to saturated zone	1.00 1.00	Very limited Ponding Depth to saturated zone	1.00 1.00	Very limited Ponding Depth to saturated zone	1.00 1.00
Tacoosh, ponded-----	25	Very limited Ponding Depth to saturated zone Organic matter content Subsidence	1.00 1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Subsidence	1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Organic matter content Subsidence	1.00 1.00 1.00 1.00

# Soil Survey of Voyageurs National Park, Minnesota

Table 11.—Dwellings and Small Commercial Buildings—Continued

Map unit symbol and soil name	Pct. of map unit	Dwellings without basements		Dwellings with basements		Small commercial buildings	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srrb: Rifle, ponded-----	10	Very limited Ponding Subsidence Depth to saturated zone Organic matter content	1.00 1.00 1.00 1.00	Very limited Ponding Subsidence Depth to saturated zone	1.00 1.00 1.00	Very limited Ponding Subsidence Depth to saturated zone Organic matter content	1.00 1.00 1.00 1.00
Hassman, ponded-----	10	Very limited Ponding Depth to saturated zone Shrink-swell	1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Shrink-swell	1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Shrink-swell	1.00 1.00 1.00
2srrh: Greenwood, seasonally ponded--	80	Very limited Ponding Subsidence Depth to saturated zone Organic matter content	1.00 1.00 1.00 1.00	Very limited Ponding Subsidence Depth to saturated zone Organic matter content	1.00 1.00 1.00 1.00	Very limited Ponding Subsidence Depth to saturated zone Organic matter content	1.00 1.00 1.00 1.00
Merwin, seasonally ponded-----	10	Very limited Ponding Depth to saturated zone Subsidence	1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Subsidence	1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Subsidence	1.00 1.00 1.00
Rifle, seasonally ponded-----	5	Very limited Ponding Subsidence Depth to saturated zone Organic matter content	1.00 1.00 1.00 1.00	Very limited Ponding Subsidence Depth to saturated zone Organic matter content	1.00 1.00 1.00 1.00	Very limited Ponding Subsidence Depth to saturated zone Organic matter content	1.00 1.00 1.00 1.00
Tacoosh, seasonally ponded-----	5	Very limited Ponding Depth to saturated zone Organic matter content Subsidence	1.00 1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Subsidence	1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Organic matter content Subsidence	1.00 1.00 1.00 1.00
2srrj: Rifle, seasonally ponded-----	80	Very limited Ponding Subsidence Depth to saturated zone Organic matter content	1.00 1.00 1.00 1.00	Very limited Ponding Subsidence Depth to saturated zone Organic matter content	1.00 1.00 1.00 1.00	Very limited Ponding Subsidence Depth to saturated zone Organic matter content	1.00 1.00 1.00 1.00

# Soil Survey of Voyageurs National Park, Minnesota

Table 11.—Dwellings and Small Commercial Buildings—Continued

Map unit symbol and soil name	Pct. of map unit	Dwellings without basements		Dwellings with basements		Small commercial buildings	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srrj: Tacoosh, seasonally ponded-----	10	Very limited Ponding Depth to saturated zone Organic matter content Subsidence	1.00 1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Subsidence	1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Organic matter content Subsidence	1.00 1.00 1.00 1.00
Greenwood, seasonally ponded--	5	Very limited Ponding Subsidence Depth to saturated zone Organic matter content	1.00 1.00 1.00 1.00	Very limited Ponding Subsidence Depth to saturated zone Organic matter content	1.00 1.00 1.00 1.00	Very limited Ponding Subsidence Depth to saturated zone Organic matter content	1.00 1.00 1.00 1.00
Aquepts, stony, moderately slow Ksat-----	5	Very limited Ponding Depth to saturated zone	1.00 1.00	Very limited Ponding Depth to saturated zone	1.00 1.00	Very limited Ponding Depth to saturated zone	1.00 1.00
2srrk: Insula, very stony, skeletal-----	30	Very limited Depth to hard bedrock Slope Large stones	1.00 1.00 1.00	Very limited Depth to hard bedrock Slope Large stones	1.00 1.00 1.00	Very limited Depth to hard bedrock Slope Large stones	1.00 1.00 1.00
Conic, very stony, skeletal-----	16	Somewhat limited Depth to hard bedrock Large stones	0.88 0.61	Very limited Depth to hard bedrock Large stones	1.00 0.61	Very limited Slope Depth to hard bedrock Large stones	1.00 0.88 0.61
Wahlsten, very stony	15	Somewhat limited Depth to saturated zone Depth to hard bedrock	0.39 0.38	Very limited Depth to saturated zone Depth to hard bedrock	1.00 1.00	Somewhat limited Depth to saturated zone Depth to hard bedrock Slope	0.39 0.38 0.01
Quetico, very stony, skeletal----	10	Very limited Depth to hard bedrock Slope Large stones	1.00 1.00 1.00	Very limited Depth to hard bedrock Slope Large stones	1.00 1.00 1.00	Very limited Depth to hard bedrock Slope Large stones	1.00 1.00 1.00
Metonga, very stony, skeletal----	9	Somewhat limited Depth to hard bedrock Large stones	0.90 0.10	Very limited Depth to hard bedrock Large stones	1.00 0.10	Very limited Slope Depth to hard bedrock Large stones	1.00 0.90 0.10

# Soil Survey of Voyageurs National Park, Minnesota

Table 11.—Dwellings and Small Commercial Buildings—Continued

Map unit symbol and soil name	Pct. of map unit	Dwellings without basements		Dwellings with basements		Small commercial buildings	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srrk: Dishno, very stony, skeletal-----	9	Somewhat limited Depth to saturated zone	0.39	Very limited Depth to saturated zone Depth to hard bedrock	1.00 0.50	Somewhat limited Depth to saturated zone Slope	0.39 0.14
Aquepts, very rubbly	3	Very limited Ponding Depth to saturated zone Large stones	1.00 1.00 0.89	Very limited Ponding Depth to saturated zone Large stones	1.00 1.00 0.89	Very limited Ponding Depth to saturated zone Large stones	1.00 1.00 0.89
Aquepts, stony, moderately slow Ksat-----	2	Very limited Ponding Depth to saturated zone	1.00 1.00	Very limited Ponding Depth to saturated zone	1.00 1.00	Very limited Ponding Depth to saturated zone	1.00 1.00
Voyageurs-----	2	Very limited Depth to saturated zone Shrink-swell	1.00 0.11	Very limited Depth to saturated zone Depth to hard bedrock	1.00 0.08	Very limited Depth to saturated zone Shrink-swell	1.00 0.11
Rock outcrop-----	2	Not rated		Not rated		Not rated	
Foglake-----	1	Very limited Depth to saturated zone Shrink-swell	1.00 1.00	Very limited Depth to saturated zone Shrink-swell	1.00 0.70	Very limited Depth to saturated zone Shrink-swell	1.00 1.00
Eaglesnest, very stony-----	1	Somewhat limited Depth to saturated zone Slope	0.39 0.16	Very limited Depth to saturated zone Slope	1.00 0.16	Very limited Slope Depth to saturated zone	1.00 0.39
2srrl: Tacoosh, occasionally flooded-----	40	Very limited Flooding Depth to saturated zone Organic matter content Subsidence	1.00 1.00 1.00 1.00	Very limited Flooding Depth to saturated zone Subsidence	1.00 1.00 1.00	Very limited Flooding Depth to saturated zone Organic matter content Subsidence	1.00 1.00 1.00 1.00
Sax, occasionally flooded-----	35	Very limited Flooding Depth to saturated zone	1.00 1.00	Very limited Flooding Depth to saturated zone	1.00 1.00	Very limited Flooding Depth to saturated zone	1.00 1.00

# Soil Survey of Voyageurs National Park, Minnesota

Table 11.—Dwellings and Small Commercial Buildings—Continued

Map unit symbol and soil name	Pct. of map unit	Dwellings without basements		Dwellings with basements		Small commercial buildings	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srrl: Cathro, occasionally flooded-----	10	Very limited Flooding Depth to saturated zone Subsidence	1.00 1.00 1.00	Very limited Flooding Depth to saturated zone Subsidence	1.00 1.00 1.00	Very limited Flooding Depth to saturated zone Subsidence	1.00 1.00 1.00
Rifle, occasionally flooded-----	10	Very limited Subsidence Flooding Depth to saturated zone Organic matter content	1.00 1.00 1.00 1.00	Very limited Subsidence Flooding Depth to saturated zone	1.00 1.00 1.00	Very limited Subsidence Flooding Depth to saturated zone Organic matter content	1.00 1.00 1.00 1.00
Hassman, occasionally flooded-----	5	Very limited Flooding Depth to saturated zone Shrink-swell	1.00 1.00 1.00	Very limited Flooding Depth to saturated zone Shrink-swell	1.00 1.00 1.00	Very limited Flooding Depth to saturated zone Shrink-swell	1.00 1.00 1.00
2srrm: Brickton-----	40	Very limited Depth to saturated zone Shrink-swell	1.00 1.00	Very limited Depth to saturated zone Shrink-swell	1.00 1.00	Very limited Depth to saturated zone Shrink-swell	1.00 1.00
Hassman-----	35	Very limited Ponding Depth to saturated zone Shrink-swell	1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Shrink-swell	1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Shrink-swell	1.00 1.00 1.00
Spooner, till/bedrock substratum-----	5	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone Depth to hard bedrock	1.00 0.99	Very limited Depth to saturated zone	1.00
Foglake-----	5	Very limited Depth to saturated zone Shrink-swell	1.00 1.00	Very limited Depth to saturated zone Shrink-swell	1.00 0.70	Very limited Depth to saturated zone Shrink-swell	1.00 1.00
Dalbo-----	5	Very limited Depth to saturated zone Shrink-swell	1.00 1.00	Very limited Depth to saturated zone Shrink-swell	1.00 1.00	Very limited Depth to saturated zone Shrink-swell	1.00 1.00
Bootleg-----	5	Very limited Depth to saturated zone Shrink-swell	1.00 0.56	Very limited Depth to saturated zone Shrink-swell	1.00 0.82	Very limited Depth to saturated zone Shrink-swell	1.00 0.56



# Soil Survey of Voyageurs National Park, Minnesota

Table 11.—Dwellings and Small Commercial Buildings—Continued

Map unit symbol and soil name	Pct. of map unit	Dwellings without basements		Dwellings with basements		Small commercial buildings	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srrm: Tacoosh-----	5	Very limited Ponding Depth to saturated zone Organic matter content Subsidence	1.00 1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Subsidence	1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Organic matter content Subsidence	1.00 1.00 1.00 1.00
2srrn: Brickton-----	60	Very limited Depth to saturated zone Shrink-swell	1.00 1.00	Very limited Depth to saturated zone Shrink-swell	1.00 1.00	Very limited Depth to saturated zone Shrink-swell	1.00 1.00
Dalbo-----	15	Very limited Depth to saturated zone Shrink-swell	1.00 1.00	Very limited Depth to saturated zone Shrink-swell	1.00 1.00	Very limited Depth to saturated zone Shrink-swell	1.00 1.00
Voyageurs-----	5	Very limited Depth to saturated zone Shrink-swell	1.00 0.11	Very limited Depth to saturated zone Depth to hard bedrock	1.00 0.08	Very limited Depth to saturated zone Shrink-swell	1.00 0.11
Foglake-----	5	Very limited Depth to saturated zone Shrink-swell	1.00 1.00	Very limited Depth to saturated zone Shrink-swell	1.00 0.70	Very limited Depth to saturated zone Shrink-swell	1.00 1.00
Spooner, till/bedrock substratum-----	5	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone Depth to hard bedrock	1.00 0.99	Very limited Depth to saturated zone	1.00
Bootleg-----	5	Very limited Depth to saturated zone Shrink-swell	1.00 0.56	Very limited Depth to saturated zone Shrink-swell	1.00 0.82	Very limited Depth to saturated zone Shrink-swell	1.00 0.56
Hassman-----	5	Very limited Ponding Depth to saturated zone Shrink-swell	1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Shrink-swell	1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Shrink-swell	1.00 1.00 1.00
2srrq: Cathro, ponded-----	60	Very limited Ponding Depth to saturated zone Subsidence	1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Subsidence	1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Subsidence	1.00 1.00 1.00

# Soil Survey of Voyageurs National Park, Minnesota

Table 11.—Dwellings and Small Commercial Buildings—Continued

Map unit symbol and soil name	Pct. of map unit	Dwellings without basements		Dwellings with basements		Small commercial buildings	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srrq: Tacoosh, ponded-----	30	Very limited Ponding Depth to saturated zone Organic matter content Subsidence	1.00 1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Subsidence	1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Organic matter content Subsidence	1.00 1.00 1.00 1.00
Sax, ponded-----	5	Very limited Ponding Depth to saturated zone	1.00 1.00	Very limited Ponding Depth to saturated zone	1.00 1.00	Very limited Ponding Depth to saturated zone	1.00 1.00
Aquepts, stony, moderately slow Ksat-----	5	Very limited Ponding Depth to saturated zone	1.00 1.00	Very limited Ponding Depth to saturated zone	1.00 1.00	Very limited Ponding Depth to saturated zone	1.00 1.00
2srrr: Insula, very stony, skeletal-----	30	Very limited Depth to hard bedrock Large stones	1.00 1.00	Very limited Depth to hard bedrock Large stones	1.00 1.00	Very limited Depth to hard bedrock Large stones Slope	1.00 1.00 0.52
Voyageurs-----	20	Very limited Depth to saturated zone Shrink-swell	1.00 0.11	Very limited Depth to saturated zone Depth to hard bedrock	1.00 0.08	Very limited Depth to saturated zone Shrink-swell	1.00 0.11
Wahlsten, very stony	15	Somewhat limited Depth to saturated zone Depth to hard bedrock	0.39 0.38	Very limited Depth to saturated zone Depth to hard bedrock	1.00 1.00	Somewhat limited Depth to saturated zone Depth to hard bedrock Slope	0.39 0.38 0.01
Conic, very stony, skeletal-----	10	Somewhat limited Depth to hard bedrock Large stones	0.88 0.61	Very limited Depth to hard bedrock Large stones	1.00 0.61	Somewhat limited Depth to hard bedrock Large stones Slope	0.88 0.61 0.52
Spooner, till/bedrock substratum-----	8	Very limited Depth to saturated zone	1.00	Very limited Depth to saturated zone Depth to hard bedrock	1.00 0.99	Very limited Depth to saturated zone	1.00
Brickton-----	5	Very limited Depth to saturated zone Shrink-swell	1.00 1.00	Very limited Depth to saturated zone Shrink-swell	1.00 1.00	Very limited Depth to saturated zone Shrink-swell	1.00 1.00

# Soil Survey of Voyageurs National Park, Minnesota

Table 11.—Dwellings and Small Commercial Buildings—Continued

Map unit symbol and soil name	Pct. of map unit	Dwellings without basements		Dwellings with basements		Small commercial buildings	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srrr: Dishno, very stony, skeletal-----	5	Somewhat limited Depth to saturated zone	0.39	Very limited Depth to saturated zone Depth to hard bedrock	1.00 0.50	Somewhat limited Depth to saturated zone Slope	0.39 0.14
Aquepts, very rubbly	3	Very limited Ponding Depth to saturated zone Large stones	1.00 1.00 0.89	Very limited Ponding Depth to saturated zone Large stones	1.00 1.00 0.89	Very limited Ponding Depth to saturated zone Large stones	1.00 1.00 0.89
Aquepts, stony, moderately slow Ksat-----	2	Very limited Ponding Depth to saturated zone	1.00 1.00	Very limited Ponding Depth to saturated zone	1.00 1.00	Very limited Ponding Depth to saturated zone	1.00 1.00
Rock outcrop-----	2	Not rated		Not rated		Not rated	
2srtr: Bowstring, frequently flooded	50	Very limited Subsidence Flooding Depth to saturated zone Organic matter content	1.00 1.00 1.00 1.00	Very limited Subsidence Flooding Depth to saturated zone	1.00 1.00 1.00	Very limited Subsidence Flooding Depth to saturated zone Organic matter content	1.00 1.00 1.00 1.00
Fluvaquents, frequently flooded	40	Very limited Flooding Depth to saturated zone	1.00 1.00	Very limited Flooding Depth to saturated zone	1.00 1.00	Very limited Flooding Depth to saturated zone	1.00 1.00
Cathro, frequently flooded-----	10	Very limited Flooding Depth to saturated zone Subsidence	1.00 1.00 1.00	Very limited Flooding Depth to saturated zone Subsidence	1.00 1.00 1.00	Very limited Flooding Depth to saturated zone Subsidence	1.00 1.00 1.00
W: Water-----	100	Not rated		Not rated		Not rated	

# Soil Survey of Voyageurs National Park, Minnesota

Table 12.—Roads and Streets, Shallow Excavations, and Landscaping

(Onsite investigation may be needed to validate the interpretations in this table and to confirm the identity of the soil on a given site. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table)

Map unit symbol and soil name	Pct. of map unit	Local roads and streets		Shallow excavations		Landscaping	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srmd: Quetico, bouldery---	35	Very limited Depth to hard bedrock Low strength Frost action Slope	1.00 1.00 0.50 0.16	Very limited Depth to hard bedrock Slope Unstable excavation walls	1.00 0.16 0.01	Very limited Depth to bedrock Droughty Low exchange capacity Slope Large stones content	1.00 1.00 0.75 0.16 0.05
Insula, bouldery----	20	Very limited Depth to hard bedrock Low strength Frost action Slope	1.00 1.00 0.50 0.16	Very limited Depth to hard bedrock Slope Unstable excavation walls	1.00 0.16 0.01	Very limited Depth to bedrock Droughty Low exchange capacity Slope Large stones content	1.00 1.00 0.75 0.16 0.08
Rock outcrop-----	15	Not rated		Not rated		Not rated	
Wahlsten, bouldery, skeletal-----	10	Somewhat limited Frost action Depth to saturated zone Depth to hard bedrock Large stones	0.50 0.19 0.10 0.01	Very limited Depth to hard bedrock Depth to saturated zone Unstable excavation walls Large stones	1.00 1.00 0.01 0.01	Very limited Large stones content Depth to saturated zone Droughty Depth to bedrock	1.00 0.19 0.07 0.03
Conic, bouldery, skeletal-----	10	Somewhat limited Depth to hard bedrock Frost action Slope Large stones	0.93 0.50 0.16 0.08	Very limited Depth to hard bedrock Slope Large stones Unstable excavation walls	1.00 0.16 0.08 0.01	Very limited Large stones content Depth to bedrock Droughty Slope	1.00 0.89 0.85 0.16
Arcadian, very stony	10	Very limited Depth to hard bedrock Slope Frost action	1.00 1.00 0.50	Very limited Depth to hard bedrock Slope Unstable excavation walls	1.00 1.00 0.01	Very limited Depth to bedrock Droughty Slope Large stones content	1.00 1.00 1.00 1.00
2srqm: Quetico, bouldery---	40	Very limited Depth to hard bedrock Low strength Slope Frost action	1.00 1.00 1.00 0.50	Very limited Depth to hard bedrock Slope Unstable excavation walls	1.00 1.00 0.01	Very limited Depth to bedrock Droughty Slope Low exchange capacity Large stones content	1.00 1.00 1.00 0.75 0.05

# Soil Survey of Voyageurs National Park, Minnesota

Table 12.—Roads and Streets, Shallow Excavations, and Landscaping—Continued

Map unit symbol and soil name	Pct. of map unit	Local roads and streets		Shallow excavations		Landscaping	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srqm: Insula, bouldery----	25	Very limited Depth to hard bedrock Low strength Slope Frost action	1.00 1.00 1.00 0.50	Very limited Depth to hard bedrock Slope Unstable excavation walls	1.00 1.00 0.01	Very limited Depth to bedrock Droughty Slope Low exchange capacity Large stones content	1.00 1.00 1.00 0.75 0.08
Rock outcrop-----	15	Not rated		Not rated		Not rated	
Conic, bouldery, skeletal-----	10	Somewhat limited Depth to hard bedrock Frost action Slope Large stones	0.93 0.50 0.16 0.08	Very limited Depth to hard bedrock Slope Large stones Unstable excavation walls	1.00 0.16 0.08 0.01	Very limited Large stones content Depth to bedrock Droughty Slope	1.00 0.89 0.85 0.16
Arcadian, very stony	10	Very limited Depth to hard bedrock Slope Frost action	1.00 1.00 0.50	Very limited Depth to hard bedrock Slope Unstable excavation walls	1.00 1.00 0.01	Very limited Depth to bedrock Droughty Slope Large stones content	1.00 1.00 1.00 1.00
2srqn: Insula, very bouldery, skeletal	35	Very limited Depth to hard bedrock Large stones Slope Frost action	1.00 1.00 1.00 0.50	Very limited Depth to hard bedrock Large stones Slope Unstable excavation walls	1.00 1.00 1.00 0.01	Very limited Depth to bedrock Droughty Slope Large stones content Low exchange capacity	1.00 1.00 1.00 1.00 0.75
Conic, very bouldery, skeletal	16	Very limited Slope Depth to hard bedrock Large stones Frost action	1.00 0.88 0.61 0.50	Very limited Depth to hard bedrock Slope Large stones Unstable excavation walls	1.00 1.00 0.61 0.01	Very limited Slope Large stones content Droughty Depth to bedrock Low exchange capacity	1.00 1.00 0.99 0.89 0.50
Rock outcrop-----	15	Not rated		Not rated		Not rated	
Metonga, very stony, skeletal----	14	Somewhat limited Depth to hard bedrock Frost action Large stones	0.90 0.50 0.10	Very limited Depth to hard bedrock Large stones Unstable excavation walls	1.00 0.10 0.01	Very limited Large stones content Droughty Depth to bedrock Low exchange capacity	1.00 0.96 0.90 0.50

# Soil Survey of Voyageurs National Park, Minnesota

Table 12.—Roads and Streets, Shallow Excavations, and Landscaping—Continued

Map unit symbol and soil name	Pct. of map unit	Local roads and streets		Shallow excavations		Landscaping	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srqn: Quetico, very bouldery, skeletal	10	Very limited Depth to hard bedrock Low strength Large stones Slope Frost action	1.00 1.00 1.00 1.00 1.00 0.50	Very limited Depth to hard bedrock Large stones Slope Unstable excavation walls	1.00 1.00 1.00 1.00 0.01 0.01	Very limited Depth to bedrock Droughty Slope Large stones content Low exchange capacity	1.00 1.00 1.00 1.00 1.00 0.50
Wahlsten, very stony	5	Somewhat limited Frost action Depth to hard bedrock Depth to saturated zone	0.50 0.38 0.19	Very limited Depth to hard bedrock Depth to saturated zone Unstable excavation walls	1.00 1.00 1.00 0.01	Somewhat limited Large stones content Gravel content Droughty Depth to bedrock Depth to saturated zone	0.99 0.51 0.45 0.39 0.19
Voyageurs-----	3	Very limited Depth to saturated zone Low strength Frost action Shrink-swell	1.00 1.00 0.50 0.11	Very limited Depth to saturated zone Depth to hard bedrock Unstable excavation walls	1.00 1.00 0.08 0.01	Very limited Depth to saturated zone	1.00
Aquepts, very rubbly	2	Very limited Ponding Depth to saturated zone Frost action Large stones	1.00 1.00 1.00 0.89	Very limited Ponding Depth to saturated zone Large stones Unstable excavation walls	1.00 1.00 0.89 0.01	Very limited Ponding Depth to saturated zone Large stones content Low exchange capacity Droughty	1.00 1.00 1.00 1.00 0.75 0.06
2srqp: Quetico, very bouldery, skeletal	31	Very limited Depth to hard bedrock Low strength Large stones Frost action Slope	1.00 1.00 1.00 1.00 0.50 0.16	Very limited Depth to hard bedrock Large stones Slope Unstable excavation walls	1.00 1.00 1.00 0.16 0.01	Very limited Depth to bedrock Droughty Large stones content Low exchange capacity Slope	1.00 1.00 1.00 1.00 0.50 0.16
Insula, very bouldery, skeletal	30	Very limited Depth to hard bedrock Large stones Frost action	1.00 1.00 1.00 0.50	Very limited Depth to hard bedrock Large stones Unstable excavation walls	1.00 1.00 1.00 0.01	Very limited Depth to bedrock Droughty Large stones content Low exchange capacity	1.00 1.00 1.00 1.00 0.75



# Soil Survey of Voyageurs National Park, Minnesota

Table 12.—Roads and Streets, Shallow Excavations, and Landscaping—Continued

Map unit symbol and soil name	Pct. of map unit	Local roads and streets		Shallow excavations		Landscaping	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srqp: Greenwood-----	15	Very limited Depth to saturated zone Subsidence Frost action Low strength	1.00 1.00 1.00 1.00	Very limited Depth to saturated zone Organic matter content Unstable excavation walls	1.00 1.00 1.00 0.01	Very limited Organic matter content Depth to saturated zone	1.00 1.00
Rock outcrop-----	9	Not rated		Not rated		Not rated	
Merwin-----	5	Very limited Ponding Depth to saturated zone Frost action Low strength Subsidence	1.00 1.00 1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Unstable excavation walls	1.00 1.00 0.01	Very limited Ponding Organic matter content Depth to saturated zone	1.00 1.00 1.00
Aquepts, very rubbly	5	Very limited Ponding Depth to saturated zone Frost action Large stones	1.00 1.00 1.00 0.89	Very limited Ponding Depth to saturated zone Large stones Unstable excavation walls	1.00 1.00 0.89 0.01	Very limited Ponding Depth to saturated zone Large stones content Low exchange capacity Droughty	1.00 1.00 1.00 0.75 0.06
Wahlsten, very stony	3	Somewhat limited Frost action Depth to hard bedrock Depth to saturated zone	0.50 0.38 0.19	Very limited Depth to hard bedrock Depth to saturated zone Unstable excavation walls	1.00 1.00 0.01	Somewhat limited Large stones content Gravel content Droughty Depth to bedrock Depth to saturated zone	0.99 0.51 0.45 0.39 0.19
Conic, very bouldery, skeletal	2	Somewhat limited Depth to hard bedrock Large stones Frost action Slope	0.88 0.61 0.50 0.16	Very limited Depth to hard bedrock Large stones Slope Unstable excavation walls	1.00 0.61 0.16 0.01	Very limited Large stones content Droughty Depth to bedrock Low exchange capacity Slope	1.00 0.99 0.89 0.50 0.16
2srqr: Greenwood-----	80	Very limited Depth to saturated zone Subsidence Frost action Low strength	1.00 1.00 1.00 1.00	Very limited Depth to saturated zone Organic matter content Unstable excavation walls	1.00 1.00 1.00 0.01	Very limited Organic matter content Depth to saturated zone	1.00 1.00

# Soil Survey of Voyageurs National Park, Minnesota

Table 12.—Roads and Streets, Shallow Excavations, and Landscaping—Continued

Map unit symbol and soil name	Pct. of map unit	Local roads and streets		Shallow excavations		Landscaping	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srqr: Merwin-----	10	Very limited Ponding Depth to saturated zone Frost action Low strength Subsidence	 1.00 1.00 1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Unstable excavation walls	 1.00 1.00 0.01	Very limited Ponding Organic matter content Depth to saturated zone	 1.00 1.00 1.00
Rifle, moat-----	5	Very limited Ponding Depth to saturated zone Subsidence Frost action Low strength	 1.00 1.00 1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Organic matter content Unstable excavation walls	 1.00 1.00 1.00 0.01	Very limited Ponding Organic matter content Depth to saturated zone	 1.00 1.00 1.00
Tacoosh, moat-----	5	Very limited Ponding Depth to saturated zone Frost action Low strength Subsidence	 1.00 1.00 1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Organic matter content Unstable excavation walls	 1.00 1.00 1.00 0.01	Very limited Ponding Organic matter content Depth to saturated zone	 1.00 1.00 1.00
2srqs: Insula, very stony, skeletal-----	30	Very limited Depth to hard bedrock Large stones Frost action Slope	 1.00 1.00 0.50 0.16	Very limited Depth to hard bedrock Large stones Slope Unstable excavation walls	 1.00 1.00 0.16 0.01	Very limited Depth to bedrock Droughty Large stones content Low exchange capacity Slope	 1.00 1.00 1.00 0.75 0.16
Conic, very stony, skeletal-----	16	Somewhat limited Depth to hard bedrock Large stones Frost action	 0.88 0.61 0.50	Very limited Depth to hard bedrock Large stones Unstable excavation walls	 1.00 0.61 0.01	Very limited Large stones content Droughty Depth to bedrock Low exchange capacity	 1.00 0.99 0.89 0.50
Wahlsten, very stony	15	Somewhat limited Frost action Depth to hard bedrock Depth to saturated zone	 0.50 0.38 0.19	Very limited Depth to hard bedrock Depth to saturated zone Unstable excavation walls	 1.00 1.00 0.01	Somewhat limited Large stones content Gravel content Droughty Depth to bedrock Depth to saturated zone	 0.99 0.51 0.45 0.39 0.19

# Soil Survey of Voyageurs National Park, Minnesota

Table 12.—Roads and Streets, Shallow Excavations, and Landscaping—Continued

Map unit symbol and soil name	Pct. of map unit	Local roads and streets		Shallow excavations		Landscaping	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srqs: Quetico, very stony, skeletal----	10	Very limited Depth to hard bedrock Low strength Large stones Frost action Slope	1.00 1.00 1.00 0.50 0.16	Very limited Depth to hard bedrock Large stones Slope Unstable excavation walls	1.00 1.00 0.16 0.01	Very limited Depth to bedrock Droughty Large stones content Low exchange capacity Slope	1.00 1.00 1.00 0.50 0.16
Metonga, very stony, skeletal----	9	Somewhat limited Depth to hard bedrock Frost action Large stones	0.90 0.50 0.10	Very limited Depth to hard bedrock Large stones Unstable excavation walls	1.00 0.10 0.01	Very limited Large stones content Droughty Depth to bedrock Low exchange capacity	1.00 0.96 0.90 0.50
Dishno, very stony, skeletal-----	9	Somewhat limited Frost action Depth to saturated zone	0.50 0.19	Very limited Depth to saturated zone Depth to hard bedrock Unstable excavation walls	1.00 0.50 0.01	Somewhat limited Large stones content Gravel content Low exchange capacity Depth to saturated zone Droughty	0.97 0.59 0.50 0.19 0.03
Aquepts, very rubbly	3	Very limited Ponding Depth to saturated zone Frost action Large stones	1.00 1.00 1.00 0.89	Very limited Ponding Depth to saturated zone Large stones Unstable excavation walls	1.00 1.00 0.89 0.01	Very limited Ponding Depth to saturated zone Large stones content Low exchange capacity Droughty	1.00 1.00 1.00 0.75 0.06
Aquepts, stony, moderately slow Ksat-----	2	Very limited Ponding Depth to saturated zone Frost action Low strength	1.00 1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Unstable excavation walls	1.00 1.00 0.01	Very limited Ponding Depth to saturated zone Low exchange capacity	1.00 1.00 0.50
Voyageurs-----	2	Very limited Depth to saturated zone Low strength Frost action Shrink-swell	1.00 1.00 0.50 0.11	Very limited Depth to saturated zone Depth to hard bedrock Unstable excavation walls	1.00 0.08 0.01	Very limited Depth to saturated zone	1.00

# Soil Survey of Voyageurs National Park, Minnesota

Table 12.—Roads and Streets, Shallow Excavations, and Landscaping—Continued

Map unit symbol and soil name	Pct. of map unit	Local roads and streets		Shallow excavations		Landscaping	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srqs: Rock outcrop-----	2	Not rated		Not rated		Not rated	
Foglake-----	1	Very limited Depth to saturated zone Shrink-swell Frost action Low strength	1.00 1.00 1.00 1.00	Very limited Depth to saturated zone Too clayey Unstable excavation walls	1.00 0.02 0.01	Very limited Depth to saturated zone	1.00
Eaglesnest, very stony-----	1	Somewhat limited Frost action Depth to saturated zone	0.50 0.19	Very limited Depth to saturated zone Dense layer Unstable excavation walls	1.00 0.50 0.01	Somewhat limited Gravel content Low exchange capacity Droughty Depth to saturated zone Large stones content	0.96 0.50 0.30 0.19 0.05
2srqv: Voyageurs, oxyaquic	35	Very limited Frost action Low strength	1.00 1.00	Very limited Depth to saturated zone Depth to hard bedrock Unstable excavation walls	1.00 0.32 0.01	Not limited	
Conic, very stony, skeletal-----	15	Somewhat limited Depth to hard bedrock Large stones Frost action	0.88 0.61 0.50	Very limited Depth to hard bedrock Large stones Unstable excavation walls	1.00 0.61 0.01	Very limited Large stones content Droughty Depth to bedrock Low exchange capacity	1.00 0.99 0.89 0.50
Littleswan-----	20	Very limited Frost action Low strength Depth to saturated zone	1.00 1.00 0.75	Very limited Depth to saturated zone Unstable excavation walls	1.00 0.01	Somewhat limited Depth to saturated zone	0.75
Insula, very stony, skeletal-----	10	Very limited Depth to hard bedrock Large stones Frost action Slope	1.00 1.00 0.50 0.16	Very limited Depth to hard bedrock Large stones Slope Unstable excavation walls	1.00 1.00 0.16 0.01	Very limited Depth to bedrock Droughty Large stones content Low exchange capacity Slope	1.00 1.00 1.00 0.75 0.16

# Soil Survey of Voyageurs National Park, Minnesota

Table 12.—Roads and Streets, Shallow Excavations, and Landscaping—Continued

Map unit symbol and soil name	Pct. of map unit	Local roads and streets		Shallow excavations		Landscaping	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srqv: Wahlsten, very stony	5	Somewhat limited Frost action Depth to hard bedrock Depth to saturated zone	0.50 0.38 0.19	Very limited Depth to hard bedrock Depth to saturated zone Unstable excavation walls	1.00 1.00 0.01	Somewhat limited Large stones content Gravel content Droughty Depth to bedrock Depth to saturated zone	0.99 0.51 0.45 0.39 0.19
Metonga, very stony, skeletal----	5	Somewhat limited Depth to hard bedrock Frost action Large stones	0.90 0.50 0.10	Very limited Depth to hard bedrock Large stones Unstable excavation walls	1.00 0.10 0.01	Very limited Large stones content Droughty Depth to bedrock Low exchange capacity	1.00 0.96 0.90 0.50
Baudette-----	5	Very limited Frost action Low strength Shrink-swell	1.00 1.00 0.02	Very limited Depth to saturated zone Unstable excavation walls	1.00 0.01	Not limited	
Aquepts, stony, moderately slow Ksat-----	4	Very limited Ponding Depth to saturated zone Frost action Low strength	1.00 1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Unstable excavation walls	1.00 1.00 0.01	Very limited Ponding Depth to saturated zone Low exchange capacity	1.00 1.00 0.50
Rock outcrop-----	1	Not rated		Not rated		Not rated	
2srqw: Wahlsten, very stony	26	Somewhat limited Frost action Depth to hard bedrock Depth to saturated zone	0.50 0.38 0.19	Very limited Depth to hard bedrock Depth to saturated zone Unstable excavation walls	1.00 1.00 0.01	Somewhat limited Large stones content Gravel content Droughty Depth to bedrock Depth to saturated zone	0.99 0.51 0.45 0.39 0.19
Spooner-----	24	Very limited Depth to saturated zone Frost action Low strength Shrink-swell	1.00 1.00 1.00 0.04	Very limited Depth to saturated zone Unstable excavation walls	1.00 0.01	Very limited Depth to saturated zone	1.00
Voyageurs-----	22	Very limited Depth to saturated zone Low strength Frost action Shrink-swell	1.00 1.00 0.50 0.11	Very limited Depth to saturated zone Depth to hard bedrock Unstable excavation walls	1.00 0.08 0.01	Very limited Depth to saturated zone	1.00

# Soil Survey of Voyageurs National Park, Minnesota

Table 12.—Roads and Streets, Shallow Excavations, and Landscaping—Continued

Map unit symbol and soil name	Pct. of map unit	Local roads and streets		Shallow excavations		Landscaping	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srqw: Insula, very stony, skeletal-----	10	Very limited Depth to hard bedrock Large stones Frost action	1.00 1.00 0.50	Very limited Depth to hard bedrock Large stones Unstable excavation walls	1.00 1.00 0.01	Very limited Depth to bedrock Droughty Large stones content Low exchange capacity	1.00 1.00 1.00 0.75
Dishno, very stony, skeletal-----	9	Somewhat limited Frost action Depth to saturated zone	0.50 0.19	Very limited Depth to saturated zone Depth to hard bedrock Unstable excavation walls	1.00 0.50 0.01	Somewhat limited Large stones content Gravel content Low exchange capacity Depth to saturated zone Droughty	0.97 0.59 0.50 0.19 0.03
Aquepts, stony, moderately slow Ksat-----	3	Very limited Ponding Depth to saturated zone Frost action Low strength	1.00 1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Unstable excavation walls	1.00 1.00 0.01	Very limited Ponding Depth to saturated zone Low exchange capacity	1.00 1.00 0.50
Littleswan-----	3	Very limited Frost action Low strength Depth to saturated zone	1.00 1.00 0.75	Very limited Depth to saturated zone Unstable excavation walls	1.00 0.01	Somewhat limited Depth to saturated zone	0.75
Aquepts, very rubbly	2	Very limited Ponding Depth to saturated zone Frost action Large stones	1.00 1.00 1.00 0.89	Very limited Ponding Depth to saturated zone Large stones Unstable excavation walls	1.00 1.00 0.89 0.01	Very limited Ponding Depth to saturated zone Large stones content Low exchange capacity Droughty	1.00 1.00 1.00 0.75 0.06
Rock outcrop-----	1	Not rated		Not rated		Not rated	
2srqy: Baudette-----	40	Very limited Frost action Low strength Shrink-swell	1.00 1.00 0.02	Very limited Depth to saturated zone Unstable excavation walls	1.00 0.01	Not limited	
Littleswan-----	35	Very limited Frost action Low strength Depth to saturated zone	1.00 1.00 0.75	Very limited Depth to saturated zone Unstable excavation walls	1.00 0.01	Somewhat limited Depth to saturated zone	0.75



# Soil Survey of Voyageurs National Park, Minnesota

Table 12.—Roads and Streets, Shallow Excavations, and Landscaping—Continued

Map unit symbol and soil name	Pct. of map unit	Local roads and streets		Shallow excavations		Landscaping	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srqy: Voyageurs-----	10	Very limited Depth to saturated zone Low strength Frost action Shrink-swell	1.00 1.00 0.50 0.11	Very limited Depth to saturated zone Depth to hard bedrock Unstable excavation walls	1.00 0.08 0.01	Very limited Depth to saturated zone	1.00
Wahlsten, very stony	5	Somewhat limited Frost action Depth to hard bedrock Depth to saturated zone	0.50 0.38 0.19	Very limited Depth to hard bedrock Depth to saturated zone Unstable excavation walls	1.00 1.00 0.01	Somewhat limited Large stones content Gravel content Droughty Depth to bedrock Depth to saturated zone	0.99 0.51 0.45 0.39 0.19
Insula, very stony, skeletal-----	5	Very limited Depth to hard bedrock Large stones Frost action	1.00 1.00 0.50	Very limited Depth to hard bedrock Large stones Unstable excavation walls	1.00 1.00 0.01	Very limited Depth to bedrock Droughty Large stones content Low exchange capacity	1.00 1.00 1.00 0.75
Spooner-----	5	Very limited Depth to saturated zone Frost action Low strength Shrink-swell	1.00 1.00 1.00 0.04	Very limited Depth to saturated zone Unstable excavation walls	1.00 0.01	Very limited Depth to saturated zone	1.00
2srqz: Canthook-----	30	Very limited Depth to saturated zone Frost action Low strength Shrink-swell	1.00 1.00 1.00 0.58	Very limited Depth to saturated zone Unstable excavation walls	1.00 0.01	Very limited Depth to saturated zone	1.00
Durkeelake-----	30	Somewhat limited Low strength Frost action Depth to saturated zone	0.78 0.50 0.22	Very limited Depth to saturated zone Unstable excavation walls	1.00 0.01	Very limited Low exchange capacity Depth to saturated zone	1.00 0.22
Bootleg-----	10	Very limited Depth to saturated zone Frost action Low strength Shrink-swell	1.00 1.00 1.00 0.56	Very limited Depth to saturated zone Too clayey Unstable excavation walls	1.00 0.02 0.01	Very limited Depth to saturated zone	1.00
Udipsamments-----	10	Not limited		Very limited Unstable excavation walls	1.00	Very limited Low exchange capacity Droughty	1.00 0.64

# Soil Survey of Voyageurs National Park, Minnesota

Table 12.—Roads and Streets, Shallow Excavations, and Landscaping—Continued

Map unit symbol and soil name	Pct. of map unit	Local roads and streets		Shallow excavations		Landscaping	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srqz: Grytal-----	10	Not limited		Very limited Depth to saturated zone Unstable excavation walls	1.00 1.00	Somewhat limited Droughty	0.52
Voyageurs-----	5	Very limited Depth to saturated zone Low strength Frost action Shrink-swell	1.00 1.00 0.50 0.11	Very limited Depth to saturated zone Depth to hard bedrock Unstable excavation walls	1.00 0.08 0.01	Very limited Depth to saturated zone	1.00
Aquepts, stony, moderately slow Ksat-----	5	Very limited Ponding Depth to saturated zone Frost action Low strength	1.00 1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Unstable excavation walls	1.00 1.00 0.01	Very limited Ponding Depth to saturated zone Low exchange capacity	1.00 1.00 0.50
2srr3: Spooner-----	40	Very limited Depth to saturated zone Frost action Low strength Shrink-swell	1.00 1.00 1.00 1.00 0.04	Very limited Depth to saturated zone Unstable excavation walls	1.00 0.01	Very limited Depth to saturated zone	1.00
Sax-----	35	Very limited Ponding Depth to saturated zone Frost action Low strength	1.00 1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Unstable excavation walls	1.00 1.00 0.01	Very limited Ponding Depth to saturated zone	1.00 1.00
Spooner, till/bedrock substratum-----	5	Very limited Depth to saturated zone Frost action Low strength	1.00 1.00 1.00	Very limited Depth to saturated zone Depth to hard bedrock Unstable excavation walls	1.00 0.99 0.01	Very limited Depth to saturated zone	1.00
Foglake-----	5	Very limited Depth to saturated zone Shrink-swell Frost action Low strength	1.00 1.00 1.00 1.00	Very limited Depth to saturated zone Too clayey Unstable excavation walls	1.00 0.02 0.01	Very limited Depth to saturated zone	1.00
Littleswan-----	5	Very limited Frost action Low strength Depth to saturated zone	1.00 1.00 0.75	Very limited Depth to saturated zone Unstable excavation walls	1.00 0.01	Somewhat limited Depth to saturated zone	0.75

# Soil Survey of Voyageurs National Park, Minnesota

Table 12.—Roads and Streets, Shallow Excavations, and Landscaping—Continued

Map unit symbol and soil name	Pct. of map unit	Local roads and streets		Shallow excavations		Landscaping	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srr3: Bootleg-----	5	Very limited Depth to saturated zone Frost action Low strength Shrink-swell	1.00 1.00 1.00 0.56	Very limited Depth to saturated zone Too clayey Unstable excavation walls	1.00 0.02 0.01	Very limited Depth to saturated zone	1.00
Canthook-----	5	Very limited Depth to saturated zone Frost action Low strength Shrink-swell	1.00 1.00 1.00 0.58	Very limited Depth to saturated zone Unstable excavation walls	1.00 0.01	Very limited Depth to saturated zone	1.00
2srr4: Littleswan-----	40	Very limited Frost action Low strength Depth to saturated zone	1.00 1.00 0.75	Very limited Depth to saturated zone Unstable excavation walls	1.00 0.01	Somewhat limited Depth to saturated zone	0.75
Spooner-----	25	Very limited Depth to saturated zone Frost action Low strength Shrink-swell	1.00 1.00 1.00 0.04	Very limited Depth to saturated zone Unstable excavation walls	1.00 0.01	Very limited Depth to saturated zone	1.00
Voyageurs-----	10	Very limited Depth to saturated zone Low strength Frost action Shrink-swell	1.00 1.00 0.50 0.11	Very limited Depth to saturated zone Depth to hard bedrock Unstable excavation walls	1.00 0.08 0.01	Very limited Depth to saturated zone	1.00
Spooner, till/bedrock substratum-----	5	Very limited Depth to saturated zone Frost action Low strength	1.00 1.00 1.00	Very limited Depth to saturated zone Depth to hard bedrock Unstable excavation walls	1.00 0.99 0.01	Very limited Depth to saturated zone	1.00
Sax-----	5	Very limited Ponding Depth to saturated zone Frost action Low strength	1.00 1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Unstable excavation walls	1.00 1.00 0.01	Very limited Ponding Depth to saturated zone	1.00 1.00
Foglake-----	5	Very limited Depth to saturated zone Shrink-swell Frost action Low strength	1.00 1.00 1.00 1.00	Very limited Depth to saturated zone Too clayey Unstable excavation walls	1.00 0.02 0.01	Very limited Depth to saturated zone	1.00

# Soil Survey of Voyageurs National Park, Minnesota

Table 12.—Roads and Streets, Shallow Excavations, and Landscaping—Continued

Map unit symbol and soil name	Pct. of map unit	Local roads and streets		Shallow excavations		Landscaping	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srr4: Bootleg-----	5	Very limited Depth to saturated zone Frost action Low strength Shrink-swell	1.00 1.00 1.00 0.56	Very limited Depth to saturated zone Too clayey Unstable excavation walls	1.00 0.02 0.01	Very limited Depth to saturated zone	1.00
Canthook-----	5	Very limited Depth to saturated zone Frost action Low strength Shrink-swell	1.00 1.00 1.00 0.58	Very limited Depth to saturated zone Unstable excavation walls	1.00 0.01	Very limited Depth to saturated zone	1.00
2srr7: Mooselake-----	80	Very limited Ponding Depth to saturated zone Subsidence Frost action Low strength	1.00 1.00 1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Organic matter content Unstable excavation walls	1.00 1.00 1.00 0.01	Very limited Ponding Organic matter content Depth to saturated zone	1.00 1.00 1.00
Tacoosh, moat-----	10	Very limited Ponding Depth to saturated zone Frost action Low strength Subsidence	1.00 1.00 1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Organic matter content Unstable excavation walls	1.00 1.00 1.00 0.01	Very limited Ponding Organic matter content Depth to saturated zone	1.00 1.00 1.00
Rifle-----	5	Very limited Ponding Depth to saturated zone Subsidence Frost action Low strength	1.00 1.00 1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Organic matter content Unstable excavation walls	1.00 1.00 1.00 0.01	Very limited Ponding Organic matter content Depth to saturated zone	1.00 1.00 1.00
Cathro, moat-----	5	Very limited Ponding Depth to saturated zone Frost action Low strength Subsidence	1.00 1.00 1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Unstable excavation walls	1.00 1.00 0.01	Very limited Ponding Organic matter content Depth to saturated zone	1.00 1.00 1.00
2srr8: Rifle-----	80	Very limited Ponding Depth to saturated zone Subsidence Frost action Low strength	1.00 1.00 1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Organic matter content Unstable excavation walls	1.00 1.00 1.00 0.01	Very limited Ponding Organic matter content Depth to saturated zone	1.00 1.00 1.00

# Soil Survey of Voyageurs National Park, Minnesota

Table 12.—Roads and Streets, Shallow Excavations, and Landscaping—Continued

Map unit symbol and soil name	Pct. of map unit	Local roads and streets		Shallow excavations		Landscaping	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srr8: Tacoosh, moat-----	10	Very limited Ponding Depth to saturated zone Frost action Low strength Subsidence	 1.00 1.00 1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Organic matter content Unstable excavation walls	 1.00 1.00 1.00 1.00 0.01	Very limited Ponding Organic matter content Depth to saturated zone	 1.00 1.00 1.00
Greenwood-----	5	Very limited Depth to saturated zone Subsidence Frost action Low strength	 1.00 1.00 1.00 1.00	Very limited Depth to saturated zone Organic matter content Unstable excavation walls	 1.00 1.00 1.00 0.01	Very limited Organic matter content Depth to saturated zone	 1.00 1.00
Aquepts, stony, moderately slow Ksat-----	5	Very limited Ponding Depth to saturated zone Frost action Low strength	 1.00 1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Unstable excavation walls	 1.00 1.00 0.01	Very limited Ponding Depth to saturated zone Low exchange capacity	 1.00 1.00 0.50
2srr9: Tacoosh, frequently flooded-----	40	Very limited Depth to saturated zone Frost action Flooding Low strength Subsidence	 1.00 1.00 1.00 1.00 1.00	Very limited Depth to saturated zone Organic matter content Flooding Unstable excavation walls	 1.00 1.00 1.00 0.80 0.01	Very limited Flooding Organic matter content Depth to saturated zone	 1.00 1.00 1.00
Sax, frequently flooded-----	35	Very limited Depth to saturated zone Frost action Flooding Low strength	 1.00 1.00 1.00 1.00	Very limited Depth to saturated zone Flooding Unstable excavation walls	 1.00 0.80 0.01	Very limited Flooding Depth to saturated zone	 1.00 1.00
Cathro, frequently flooded-----	10	Very limited Depth to saturated zone Frost action Flooding Low strength Subsidence	 1.00 1.00 1.00 1.00 1.00	Very limited Depth to saturated zone Flooding Unstable excavation walls	 1.00 0.80 0.01	Very limited Flooding Organic matter content Depth to saturated zone	 1.00 1.00 1.00

# Soil Survey of Voyageurs National Park, Minnesota

Table 12.—Roads and Streets, Shallow Excavations, and Landscaping—Continued

Map unit symbol and soil name	Pct. of map unit	Local roads and streets		Shallow excavations		Landscaping	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srr9: Rifle, frequently flooded-----	10	Very limited Depth to saturated zone Subsidence Frost action Flooding Low strength	1.00 1.00 1.00 1.00 1.00	Very limited Depth to saturated zone Organic matter content Flooding Unstable excavation walls	1.00 1.00 1.00 0.80 0.01	Very limited Flooding Organic matter content Depth to saturated zone	1.00 1.00 1.00
Hassman, frequently flooded-----	5	Very limited Depth to saturated zone Shrink-swell Frost action Flooding Low strength	1.00 1.00 1.00 1.00 1.00	Very limited Depth to saturated zone Flooding Unstable excavation walls	1.00 0.80 0.01	Very limited Flooding Depth to saturated zone	1.00 1.00
2srrb: Aguents, ponded-----	30	Very limited Ponding Depth to saturated zone Frost action Low strength	1.00 1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Unstable excavation walls	1.00 1.00 0.01	Very limited Ponding Depth to saturated zone	1.00 1.00
Sax, ponded-----	25	Very limited Ponding Depth to saturated zone Frost action Low strength	1.00 1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Unstable excavation walls	1.00 1.00 0.01	Very limited Ponding Depth to saturated zone	1.00 1.00
Tacoosh, ponded-----	25	Very limited Ponding Depth to saturated zone Frost action Low strength Subsidence	1.00 1.00 1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Organic matter content Unstable excavation walls	1.00 1.00 1.00 0.01	Very limited Ponding Organic matter content Depth to saturated zone	1.00 1.00 1.00
Rifle, ponded-----	10	Very limited Ponding Depth to saturated zone Subsidence Frost action Low strength	1.00 1.00 1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Organic matter content Unstable excavation walls	1.00 1.00 1.00 0.01	Very limited Ponding Organic matter content Depth to saturated zone	1.00 1.00 1.00
Hassman, ponded-----	10	Very limited Ponding Depth to saturated zone Shrink-swell Frost action Low strength	1.00 1.00 1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Unstable excavation walls	1.00 1.00 0.01	Very limited Ponding Depth to saturated zone	1.00 1.00



# Soil Survey of Voyageurs National Park, Minnesota

Table 12.—Roads and Streets, Shallow Excavations, and Landscaping—Continued

Map unit symbol and soil name	Pct. of map unit	Local roads and streets		Shallow excavations		Landscaping	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srrh: Greenwood, seasonally ponded--	80	Very limited Ponding Depth to saturated zone Subsidence Frost action Low strength	 1.00 1.00 1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Organic matter content Unstable excavation walls	 1.00 1.00 1.00 1.00 0.01	Very limited Ponding Organic matter content Depth to saturated zone	 1.00 1.00 1.00
Merwin, seasonally ponded-----	10	Very limited Ponding Depth to saturated zone Frost action Low strength Subsidence	 1.00 1.00 1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Unstable excavation walls	 1.00 1.00 0.01	Very limited Ponding Organic matter content Depth to saturated zone	 1.00 1.00 1.00
Rifle, seasonally ponded-----	5	Very limited Ponding Depth to saturated zone Subsidence Frost action Low strength	 1.00 1.00 1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Organic matter content Unstable excavation walls	 1.00 1.00 1.00 1.00 0.01	Very limited Ponding Organic matter content Depth to saturated zone	 1.00 1.00 1.00
Tacoosh, seasonally ponded-----	5	Very limited Ponding Depth to saturated zone Frost action Low strength Subsidence	 1.00 1.00 1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Organic matter content Unstable excavation walls	 1.00 1.00 1.00 1.00 0.01	Very limited Ponding Organic matter content Depth to saturated zone	 1.00 1.00 1.00
2srrj: Rifle, seasonally ponded-----	80	Very limited Ponding Depth to saturated zone Subsidence Frost action Low strength	 1.00 1.00 1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Organic matter content Unstable excavation walls	 1.00 1.00 1.00 1.00 0.01	Very limited Ponding Organic matter content Depth to saturated zone	 1.00 1.00 1.00
Tacoosh, seasonally ponded-----	10	Very limited Ponding Depth to saturated zone Frost action Low strength Subsidence	 1.00 1.00 1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Organic matter content Unstable excavation walls	 1.00 1.00 1.00 1.00 0.01	Very limited Ponding Organic matter content Depth to saturated zone	 1.00 1.00 1.00

# Soil Survey of Voyageurs National Park, Minnesota

Table 12.—Roads and Streets, Shallow Excavations, and Landscaping—Continued

Map unit symbol and soil name	Pct. of map unit	Local roads and streets		Shallow excavations		Landscaping	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srrj: Greenwood, seasonally ponded--	5	Very limited Ponding Depth to saturated zone Subsidence Frost action Low strength	 1.00 1.00  1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Organic matter content Unstable excavation walls	 1.00 1.00  1.00  0.01	Very limited Ponding Organic matter content Depth to saturated zone	 1.00 1.00  1.00
Aquepts, stony, moderately slow Ksat-----	5	Very limited Ponding Depth to saturated zone Frost action Low strength	 1.00 1.00  1.00 1.00	Very limited Ponding Depth to saturated zone Unstable excavation walls	 1.00 1.00  0.01	Very limited Ponding Depth to saturated zone Low exchange capacity	 1.00 1.00  0.50
2srrk: Insula, very stony, skeletal-----	30	Very limited Depth to hard bedrock Large stones Slope Frost action	 1.00 1.00 1.00 1.00 0.50	Very limited Depth to hard bedrock Large stones Slope Unstable excavation walls	 1.00 1.00 1.00 1.00 0.01	Very limited Depth to bedrock Droughty Slope Large stones content Low exchange capacity	 1.00 1.00 1.00 1.00 0.75
Conic, very stony, skeletal-----	16	Somewhat limited Depth to hard bedrock Large stones Frost action	 0.88  0.61 0.50	Very limited Depth to hard bedrock Large stones Unstable excavation walls	 1.00  0.61 0.01	Very limited Large stones content Droughty Depth to bedrock Low exchange capacity	 1.00  0.99 0.89 0.50
Wahlsten, very stony	15	Somewhat limited Frost action Depth to hard bedrock Depth to saturated zone	 0.50 0.38  0.19	Very limited Depth to hard bedrock Depth to saturated zone Unstable excavation walls	 1.00  1.00 0.01	Somewhat limited Large stones content Gravel content Droughty Depth to bedrock Depth to saturated zone	 0.99  0.51 0.45 0.39 0.19
Quetico, very stony, skeletal----	10	Very limited Depth to hard bedrock Low strength Large stones Slope Frost action	 1.00 1.00 1.00 1.00 0.50	Very limited Depth to hard bedrock Large stones Slope Unstable excavation walls	 1.00 1.00 1.00 0.01	Very limited Depth to bedrock Droughty Slope Large stones content Low exchange capacity	 1.00 1.00 1.00 1.00 0.50

# Soil Survey of Voyageurs National Park, Minnesota

Table 12.—Roads and Streets, Shallow Excavations, and Landscaping—Continued

Map unit symbol and soil name	Pct. of map unit	Local roads and streets		Shallow excavations		Landscaping	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srrk: Metonga, very stony, skeletal----	9	Somewhat limited Depth to hard bedrock Frost action Large stones	0.90 0.50 0.10	Very limited Depth to hard bedrock Large stones Unstable excavation walls	1.00 0.10 0.01	Very limited Large stones content Droughty Depth to bedrock Low exchange capacity	1.00 0.96 0.90 0.50
Dishno, very stony, skeletal-----	9	Somewhat limited Frost action Depth to saturated zone	0.50 0.19	Very limited Depth to saturated zone Depth to hard bedrock Unstable excavation walls	1.00 0.50 0.01	Somewhat limited Large stones content Gravel content Low exchange capacity Depth to saturated zone Droughty	0.97 0.59 0.50 0.19 0.03
Aquepts, very rubbly	3	Very limited Ponding Depth to saturated zone Frost action Large stones	1.00 1.00 1.00 0.89	Very limited Ponding Depth to saturated zone Large stones Unstable excavation walls	1.00 1.00 0.89 0.01	Very limited Ponding Depth to saturated zone Large stones content Low exchange capacity Droughty	1.00 1.00 1.00 0.75 0.06
Aquepts, stony, moderately slow Ksat-----	2	Very limited Ponding Depth to saturated zone Frost action Low strength	1.00 1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Unstable excavation walls	1.00 1.00 0.01	Very limited Ponding Depth to saturated zone Low exchange capacity	1.00 1.00 0.50
Voyageurs-----	2	Very limited Depth to saturated zone Low strength Frost action Shrink-swell	1.00 1.00 0.50 0.11	Very limited Depth to saturated zone Depth to hard bedrock Unstable excavation walls	1.00 0.08 0.01	Very limited Depth to saturated zone	1.00
Rock outcrop-----	2	Not rated		Not rated		Not rated	
Foglake-----	1	Very limited Depth to saturated zone Shrink-swell Frost action Low strength	1.00 1.00 1.00 1.00	Very limited Depth to saturated zone Too clayey Unstable excavation walls	1.00 0.02 0.01	Very limited Depth to saturated zone	1.00

# Soil Survey of Voyageurs National Park, Minnesota

Table 12.—Roads and Streets, Shallow Excavations, and Landscaping—Continued

Map unit symbol and soil name	Pct. of map unit	Local roads and streets		Shallow excavations		Landscaping	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srrk: Eaglesnest, very stony-----	1	Somewhat limited Frost action Depth to saturated zone Slope	0.50 0.19 0.16	Very limited Depth to saturated zone Dense layer Slope Unstable excavation walls	1.00 0.50 0.16 0.01	Somewhat limited Gravel content Low exchange capacity Droughty Depth to saturated zone Slope	0.96 0.50 0.30 0.19 0.16
2srri: Tacoosh, occasionally flooded-----	40	Very limited Depth to saturated zone Frost action Flooding Low strength Subsidence	1.00 1.00 1.00 1.00	Very limited Depth to saturated zone Organic matter content Flooding Unstable excavation walls	1.00 1.00 0.60 0.01	Very limited Organic matter content Depth to saturated zone Flooding	1.00 1.00 0.60
Sax, occasionally flooded-----	35	Very limited Depth to saturated zone Frost action Flooding Low strength	1.00 1.00 1.00 1.00	Very limited Depth to saturated zone Flooding Unstable excavation walls	1.00 0.60 0.01	Very limited Depth to saturated zone Flooding	1.00 0.60
Cathro, occasionally flooded-----	10	Very limited Depth to saturated zone Frost action Flooding Low strength Subsidence	1.00 1.00 1.00 1.00 1.00	Very limited Depth to saturated zone Flooding Unstable excavation walls	1.00 0.60 0.01	Very limited Organic matter content Depth to saturated zone Flooding	1.00 1.00 0.60
Rifle, occasionally flooded-----	10	Very limited Depth to saturated zone Subsidence Frost action Flooding Low strength	1.00 1.00 1.00 1.00 1.00	Very limited Depth to saturated zone Organic matter content Flooding Unstable excavation walls	1.00 1.00 0.60 0.01	Very limited Organic matter content Depth to saturated zone Flooding	1.00 1.00 0.60
Hassman, occasionally flooded-----	5	Very limited Depth to saturated zone Shrink-swell Frost action Flooding Low strength	1.00 1.00 1.00 1.00 1.00	Very limited Depth to saturated zone Flooding Unstable excavation walls	1.00 0.60 0.01	Very limited Depth to saturated zone Flooding	1.00 0.60

# Soil Survey of Voyageurs National Park, Minnesota

Table 12.—Roads and Streets, Shallow Excavations, and Landscaping—Continued

Map unit symbol and soil name	Pct. of map unit	Local roads and streets		Shallow excavations		Landscaping	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srm: Brickton-----	40	Very limited Depth to saturated zone Shrink-swell Frost action Low strength	1.00 1.00 1.00 1.00	Very limited Depth to saturated zone Unstable excavation walls Too clayey	1.00 0.17 0.08	Very limited Depth to saturated zone	1.00
Hassman-----	35	Very limited Ponding Depth to saturated zone Shrink-swell Frost action Low strength	1.00 1.00 1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Unstable excavation walls	1.00 1.00 0.01	Very limited Ponding Depth to saturated zone	1.00 1.00
Spooner, till/bedrock substratum-----	5	Very limited Depth to saturated zone Frost action Low strength	1.00 1.00 1.00	Very limited Depth to saturated zone Depth to hard bedrock Unstable excavation walls	1.00 0.99 0.01	Very limited Depth to saturated zone	1.00
Foglake-----	5	Very limited Depth to saturated zone Shrink-swell Frost action Low strength	1.00 1.00 1.00 1.00	Very limited Depth to saturated zone Too clayey Unstable excavation walls	1.00 0.02 0.01	Very limited Depth to saturated zone	1.00
Dalbo-----	5	Very limited Depth to saturated zone Shrink-swell Frost action Low strength	1.00 1.00 1.00 1.00	Very limited Depth to saturated zone Unstable excavation walls Too clayey	1.00 0.19 0.08	Very limited Depth to saturated zone	1.00
Bootleg-----	5	Very limited Depth to saturated zone Frost action Low strength Shrink-swell	1.00 1.00 1.00 1.00 0.56	Very limited Depth to saturated zone Too clayey Unstable excavation walls	1.00 0.02 0.01	Very limited Depth to saturated zone	1.00
Tacoosh-----	5	Very limited Ponding Depth to saturated zone Frost action Low strength Subsidence	1.00 1.00 1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Organic matter content Unstable excavation walls	1.00 1.00 1.00 0.01	Very limited Ponding Organic matter content Depth to saturated zone	1.00 1.00 1.00

# Soil Survey of Voyageurs National Park, Minnesota

Table 12.—Roads and Streets, Shallow Excavations, and Landscaping—Continued

Map unit symbol and soil name	Pct. of map unit	Local roads and streets		Shallow excavations		Landscaping	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srrn: Brickton-----	60	Very limited Depth to saturated zone Shrink-swell Frost action Low strength	1.00 1.00 1.00 1.00	Very limited Depth to saturated zone Unstable excavation walls Too clayey	1.00 0.17 0.08	Very limited Depth to saturated zone	1.00
Dalbo-----	15	Very limited Depth to saturated zone Shrink-swell Frost action Low strength	1.00 1.00 1.00 1.00	Very limited Depth to saturated zone Unstable excavation walls Too clayey	1.00 0.19 0.08	Very limited Depth to saturated zone	1.00
Voyageurs-----	5	Very limited Depth to saturated zone Low strength Frost action Shrink-swell	1.00 1.00 0.50 0.11	Very limited Depth to saturated zone Depth to hard bedrock Unstable excavation walls	1.00 0.08 0.01	Very limited Depth to saturated zone	1.00
Foglake-----	5	Very limited Depth to saturated zone Shrink-swell Frost action Low strength	1.00 1.00 1.00 1.00	Very limited Depth to saturated zone Too clayey Unstable excavation walls	1.00 0.02 0.01	Very limited Depth to saturated zone	1.00
Spooner, till/bedrock substratum-----	5	Very limited Depth to saturated zone Frost action Low strength	1.00 1.00 1.00	Very limited Depth to saturated zone Depth to hard bedrock Unstable excavation walls	1.00 0.99 0.01	Very limited Depth to saturated zone	1.00
Bootleg-----	5	Very limited Depth to saturated zone Frost action Low strength Shrink-swell	1.00 1.00 1.00 0.56	Very limited Depth to saturated zone Too clayey Unstable excavation walls	1.00 0.02 0.01	Very limited Depth to saturated zone	1.00
Hassman-----	5	Very limited Ponding Depth to saturated zone Shrink-swell Frost action Low strength	1.00 1.00 1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Unstable excavation walls	1.00 1.00 0.01	Very limited Ponding Depth to saturated zone	1.00 1.00



# Soil Survey of Voyageurs National Park, Minnesota

Table 12.—Roads and Streets, Shallow Excavations, and Landscaping—Continued

Map unit symbol and soil name	Pct. of map unit	Local roads and streets		Shallow excavations		Landscaping	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srrq: Cathro, ponded-----	60	Very limited Ponding Depth to saturated zone Frost action Low strength Subsidence	 1.00 1.00 1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Unstable excavation walls	 1.00 1.00 0.01	Very limited Ponding Organic matter content Depth to saturated zone	 1.00 1.00 1.00
Tacoosh, ponded-----	30	Very limited Ponding Depth to saturated zone Frost action Low strength Subsidence	 1.00 1.00 1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Organic matter content Unstable excavation walls	 1.00 1.00 1.00 0.01	Very limited Ponding Organic matter content Depth to saturated zone	 1.00 1.00 1.00
Sax, ponded-----	5	Very limited Ponding Depth to saturated zone Frost action Low strength	 1.00 1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Unstable excavation walls	 1.00 1.00 0.01	Very limited Ponding Depth to saturated zone	 1.00 1.00
Aquepts, stony, moderately slow Ksat-----	5	Very limited Ponding Depth to saturated zone Frost action Low strength	 1.00 1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Unstable excavation walls	 1.00 1.00 0.01	Very limited Ponding Depth to saturated zone Low exchange capacity	 1.00 1.00 0.50
2srrr: Insula, very stony, skeletal-----	30	Very limited Depth to hard bedrock Large stones Frost action	 1.00 1.00 0.50	Very limited Depth to hard bedrock Large stones Unstable excavation walls	 1.00 1.00 0.01	Very limited Depth to bedrock Droughty Large stones content Low exchange capacity	 1.00 1.00 1.00 0.75
Voyageurs-----	20	Very limited Depth to saturated zone Low strength Frost action Shrink-swell	 1.00 1.00 0.50 0.11	Very limited Depth to saturated zone Depth to hard bedrock Unstable excavation walls	 1.00 0.08 0.01	Very limited Depth to saturated zone	 1.00
Wahlsten, very stony	15	Somewhat limited Frost action Depth to hard bedrock Depth to saturated zone	 0.50 0.38 0.19	Very limited Depth to hard bedrock Depth to saturated zone Unstable excavation walls	 1.00 1.00 0.01	Somewhat limited Large stones content Gravel content Droughty Depth to bedrock Depth to saturated zone	 0.99 0.51 0.45 0.39 0.19

# Soil Survey of Voyageurs National Park, Minnesota

Table 12.—Roads and Streets, Shallow Excavations, and Landscaping—Continued

Map unit symbol and soil name	Pct. of map unit	Local roads and streets		Shallow excavations		Landscaping	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srrr: Conic, very stony, skeletal-----	10	Somewhat limited Depth to hard bedrock Large stones Frost action	0.88 0.61 0.50	Very limited Depth to hard bedrock Large stones Unstable excavation walls	1.00 0.61 0.01	Very limited Large stones content Droughty Depth to bedrock Low exchange capacity	1.00 0.99 0.89 0.50
Spooner, till/bedrock substratum-----	8	Very limited Depth to saturated zone Frost action Low strength	1.00 1.00 1.00	Very limited Depth to saturated zone Depth to hard bedrock Unstable excavation walls	1.00 0.99 0.01	Very limited Depth to saturated zone	1.00
Brickton-----	5	Very limited Depth to saturated zone Shrink-swell Frost action Low strength	1.00 1.00 1.00 1.00	Very limited Depth to saturated zone Unstable excavation walls Too clayey	1.00 0.17 0.08	Very limited Depth to saturated zone	1.00
Dishno, very stony, skeletal-----	5	Somewhat limited Frost action Depth to saturated zone	0.50 0.19	Very limited Depth to saturated zone Depth to hard bedrock Unstable excavation walls	1.00 0.50 0.01	Somewhat limited Large stones content Gravel content Low exchange capacity Depth to saturated zone Droughty	0.97 0.59 0.50 0.19 0.03
Aquepts, very rubbly	3	Very limited Ponding Depth to saturated zone Frost action Large stones	1.00 1.00 1.00 0.89	Very limited Ponding Depth to saturated zone Large stones Unstable excavation walls	1.00 1.00 0.89 0.01	Very limited Ponding Depth to saturated zone Large stones content Low exchange capacity Droughty	1.00 1.00 1.00 0.75 0.06
Aquepts, stony, moderately slow Ksat-----	2	Very limited Ponding Depth to saturated zone Frost action Low strength	1.00 1.00 1.00 1.00	Very limited Ponding Depth to saturated zone Unstable excavation walls	1.00 1.00 0.01	Very limited Ponding Depth to saturated zone Low exchange capacity	1.00 1.00 0.50
Rock outcrop-----	2	Not rated		Not rated		Not rated	

# Soil Survey of Voyageurs National Park, Minnesota

Table 12.—Roads and Streets, Shallow Excavations, and Landscaping—Continued

Map unit symbol and soil name	Pct. of map unit	Local roads and streets		Shallow excavations		Landscaping	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srst: Bowstring, frequently flooded	50	Very limited Depth to saturated zone Subsidence Frost action Flooding Low strength	1.00 1.00 1.00 1.00 1.00	Very limited Depth to saturated zone Organic matter content Flooding Unstable excavation walls	1.00 1.00 1.00 0.80 0.01	Very limited Flooding Organic matter content Depth to saturated zone	1.00 1.00 1.00 1.00
Fluvaquents, frequently flooded	40	Very limited Depth to saturated zone Frost action Flooding	1.00 1.00 1.00	Very limited Depth to saturated zone Flooding Unstable excavation walls	1.00 0.80 0.01	Very limited Flooding Depth to saturated zone	1.00 1.00
Cathro, frequently flooded-----	10	Very limited Depth to saturated zone Frost action Flooding Low strength Subsidence	1.00 1.00 1.00 1.00 1.00	Very limited Depth to saturated zone Flooding Unstable excavation walls	1.00 0.80 0.01	Very limited Flooding Organic matter content Depth to saturated zone	1.00 1.00 1.00
W: Water-----	100	Not rated		Not rated		Not rated	

# Soil Survey of Voyageurs National Park, Minnesota

Table 13.—Sewage Disposal

(Onsite investigation may be needed to validate the interpretations in this table and to confirm the identity of the soil on a given site. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table)

Map unit symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srmd: Quetico, bouldery---	35	Very limited Depth to bedrock Seepage, bottom layer Slope	1.00 1.00 0.16	Very limited Depth to hard bedrock Slope	1.00 1.00
Insula, bouldery----	20	Very limited Depth to bedrock Seepage, bottom layer Slope	1.00 1.00 0.16	Very limited Depth to hard bedrock Slope	1.00 1.00
Rock outcrop-----	15	Not rated		Not rated	
Wahlsten, bouldery, skeletal-----	10	Very limited Depth to saturated zone Depth to bedrock Slow water movement Large stones	1.00 1.00 0.47 0.01	Very limited Depth to hard bedrock Seepage Large stones Depth to saturated zone Slope	1.00 1.00 0.75 0.75 0.32
Conic, bouldery, skeletal-----	10	Very limited Depth to bedrock Seepage, bottom layer Slope Large stones	1.00 1.00 0.16 0.08	Very limited Depth to hard bedrock Seepage Slope Large stones	1.00 1.00 1.00 1.00 0.77
Arcadian, very stony	10	Very limited Depth to bedrock Seepage, bottom layer Slope	1.00 1.00 1.00	Very limited Depth to hard bedrock Seepage Slope Large stones	1.00 1.00 1.00 1.00 0.06
2srqm: Quetico, bouldery---	40	Very limited Depth to bedrock Seepage, bottom layer Slope	1.00 1.00 1.00	Very limited Depth to hard bedrock Slope	1.00 1.00
Insula, bouldery----	25	Very limited Depth to bedrock Slope Seepage, bottom layer	1.00 1.00 1.00	Very limited Depth to hard bedrock Slope	1.00 1.00
Rock outcrop-----	15	Not rated		Not rated	

Soil Survey of Voyageurs National Park, Minnesota

Table 13.—Sewage Disposal—Continued

Map unit symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srqm: Conic, bouldery, skeletal-----	10	Very limited Depth to bedrock Seepage, bottom layer Slope Large stones	1.00 1.00 0.16 0.08	Very limited Depth to hard bedrock Seepage Slope Large stones	1.00 1.00 1.00 0.77
Arcadian, very stony	10	Very limited Depth to bedrock Seepage, bottom layer Slope	1.00 1.00 1.00	Very limited Depth to hard bedrock Seepage Slope Large stones	1.00 1.00 1.00 0.06
2srqn: Insula, very bouldery, skeletal	35	Very limited Depth to bedrock Seepage, bottom layer Slope Large stones	1.00 1.00 1.00 1.00	Very limited Depth to hard bedrock Organic matter content Slope Seepage Large stones	1.00 1.00 1.00 1.00 1.00
Conic, very bouldery, skeletal	16	Very limited Seepage, bottom layer Depth to bedrock Slope Large stones	1.00 1.00 1.00 0.61	Very limited Depth to hard bedrock Slope Seepage Large stones	1.00 1.00 1.00 1.00
Rock outcrop-----	15	Not rated		Not rated	
Metonga, very stony, skeletal----	14	Very limited Depth to bedrock Seepage, bottom layer Large stones	1.00 1.00 0.10	Very limited Depth to hard bedrock Seepage Slope Large stones	1.00 1.00 1.00 0.99
Quetico, very bouldery, skeletal	10	Very limited Depth to bedrock Seepage, bottom layer Slope Large stones	1.00 1.00 1.00 1.00	Very limited Depts to hard bedrock Slope Large stones	1.00 1.00 1.00
Wahlsten, very stony	5	Very limited Depth to saturated zone Depth to bedrock Seepage, bottom layer	1.00 1.00 1.00	Very limited Depth to hard bedrock Organic matter content Depth to saturated zone Seepage Slope	1.00 1.00 1.00 1.00 0.32

Soil Survey of Voyageurs National Park, Minnesota

Table 13.—Sewage Disposal—Continued

Map unit symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srqn: Voyageurs-----	3	Very limited Depth to saturated zone Slow water movement Seepage, bottom layer Depth to bedrock	1.00 1.00 1.00 1.00 0.50	Very limited Organic matter content Depth to saturated zone Seepage Depth to hard bedrock	1.00 1.00 1.00 0.08
Aquepts, very rubbly	2	Very limited Ponding Depth to saturated zone Slow water movement Large stones	1.00 1.00 1.00 0.89	Very limited Ponding Depth to saturated zone Large stones Seepage	1.00 1.00 1.00 0.53
2srqp: Quetico, very bouldery, skeletal	31	Very limited Depth to bedrock Seepage, bottom layer Large stones Slope	1.00 1.00 1.00 0.16	Very limited Depth to hard bedrock Slope Large stones	1.00 1.00 1.00
Insula, very bouldery, skeletal	30	Very limited Depth to bedrock Seepage, bottom layer Large stones	1.00 1.00 1.00	Very limited Depth to hard bedrock Organic matter content Seepage Large stones Slope	1.00 1.00 1.00 1.00 1.00
Greenwood-----	15	Very limited Depth to saturated zone Filtering capacity Seepage, bottom layer Subsidence	1.00 1.00 1.00 1.00	Very limited Organic matter content Seepage Depth to saturated zone	1.00 1.00 1.00
Rock outcrop-----	9	Not rated		Not rated	
Merwin-----	5	Very limited Ponding Depth to saturated zone Slow water movement Subsidence	1.00 1.00 1.00 1.00	Very limited Ponding Organic matter content Seepage Depth to saturated zone	1.00 1.00 1.00 1.00



Soil Survey of Voyageurs National Park, Minnesota

Table 13.—Sewage Disposal—Continued

Map unit symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srqp: Aquepts, very rubbly	5	Very limited Ponding Depth to saturated zone Slow water movement Large stones	1.00 1.00 1.00 0.89	Very limited Ponding Depth to saturated zone Large stones Seepage	1.00 1.00 1.00 0.53
Wahlsten, very stony	3	Very limited Depth to saturated zone Depth to bedrock Seepage, bottom layer	1.00 1.00 1.00	Very limited Depth to hard bedrock Organic matter content Depth to saturated zone Seepage Slope	1.00 1.00 1.00 1.00 0.32
Conic, very bouldery, skeletal	2	Very limited Seepage, bottom layer Depth to bedrock Large stones Slope	1.00 1.00 0.61 0.16	Very limited Depth to hard bedrock Seepage Slope Large stones	1.00 1.00 1.00 1.00
2srqr: Greenwood-----	80	Very limited Depth to saturated zone Filtering capacity Seepage, bottom layer Subsidence	1.00 1.00 1.00 1.00	Very limited Organic matter content Seepage Depth to saturated zone	1.00 1.00 1.00
Merwin-----	10	Very limited Ponding Depth to saturated zone Slow water movement Subsidence	1.00 1.00 1.00 1.00	Very limited Ponding Organic matter content Seepage Depth to saturated zone	1.00 1.00 1.00 1.00
Rifle, moat-----	5	Very limited Ponding Depth to saturated zone Slow water movement Subsidence	1.00 1.00 1.00 1.00	Very limited Ponding Organic matter content Seepage Depth to saturated zone	1.00 1.00 1.00 1.00
Tacoosh, moat-----	5	Very limited Ponding Depth to saturated zone Slow water movement	1.00 1.00 1.00	Very limited Ponding Organic matter content Seepage Depth to saturated zone	1.00 1.00 1.00 1.00

Soil Survey of Voyageurs National Park, Minnesota

Table 13.—Sewage Disposal—Continued

Map unit symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srqs: Insula, very stony, skeletal-----	30	Very limited Depth to bedrock Seepage, bottom layer Large stones Slope	1.00 1.00 1.00 0.16	Very limited Depth to hard bedrock Organic matter content Seepage Large stones Slope	1.00 1.00 1.00 1.00 1.00 1.00
Conic, very stony, skeletal-----	16	Very limited Seepage, bottom layer Depth to bedrock Large stones	1.00 1.00 0.61	Very limited Depth to hard bedrock Seepage Slope Large stones	1.00 1.00 1.00 1.00 1.00
Wahlsten, very stony	15	Very limited Depth to saturated zone Depth to bedrock Seepage, bottom layer	1.00 1.00 1.00	Very limited Depth to hard bedrock Organic matter content Depth to saturated zone Seepage Slope	1.00 1.00 1.00 1.00 1.00 0.32
Quetico, very stony, skeletal----	10	Very limited Depth to bedrock Seepage, bottom layer Large stones Slope	1.00 1.00 1.00 0.16	Very limited Depth to hard bedrock Slope Large stones	1.00 1.00 1.00 1.00
Metonga, very stony, skeletal----	9	Very limited Depth to bedrock Seepage, bottom layer Large stones	1.00 1.00 0.10	Very limited Depth to hard bedrock Seepage Slope Large stones	1.00 1.00 1.00 0.99
Dishno, very stony, skeletal-----	9	Very limited Depth to saturated zone Seepage, bottom layer Depth to bedrock	1.00 1.00 0.81	Very limited Depth to saturated zone Seepage Slope Depth to hard bedrock	1.00 1.00 0.68 0.50
Aquepts, very rubbly	3	Very limited Ponding Depth to saturated zone Slow water movement Large stones	1.00 1.00 1.00 0.89	Very limited Ponding Depth to saturated zone Large stones Seepage	1.00 1.00 1.00 0.53

# Soil Survey of Voyageurs National Park, Minnesota

Table 13.—Sewage Disposal—Continued

Map unit symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srqs: Aquepts, stony, moderately slow Ksat-----	2	Very limited Ponding Depth to saturated zone Slow water movement	1.00 1.00 1.00	Very limited Ponding Organic matter content Depth to saturated zone Seepage	1.00 1.00 1.00 0.53
Voyageurs-----	2	Very limited Depth to saturated zone Slow water movement Seepage, bottom layer Depth to bedrock	1.00 1.00 1.00 1.00 0.50	Very limited Organic matter content Depth to saturated zone Seepage Depth to hard bedrock	1.00 1.00 1.00 0.08
Rock outcrop-----	2	Not rated		Not rated	
Foglake-----	1	Very limited Depth to saturated zone Slow water movement	1.00 1.00	Very limited Organic matter content Depth to saturated zone Seepage	1.00 1.00 0.53
Eaglesnest, very stony-----	1	Very limited Depth to saturated zone Slow water movement	1.00 1.00	Very limited Seepage Slope Depth to saturated zone	1.00 1.00 0.75
2srqv: Voyageurs, oxyaquic	35	Very limited Depth to saturated zone Slow water movement Seepage, bottom layer Depth to bedrock	1.00 1.00 1.00 1.00 0.62	Very limited Depth to saturated zone Seepage Slope Depth to hard bedrock	1.00 1.00 0.32 0.32
Conic, very stony, skeletal-----	15	Very limited Seepage, bottom layer Depth to bedrock Large stones	1.00 1.00 0.61	Very limited Depth to hard bedrock Seepage Slope Large stones	1.00 1.00 1.00 1.00
Little Swan-----	20	Very limited Depth to saturated zone Slow water movement	1.00 1.00	Very limited Depth to saturated zone Seepage	1.00 0.53

Soil Survey of Voyageurs National Park, Minnesota

Table 13.—Sewage Disposal—Continued

Map unit symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srqv: Insula, very stony, skeletal-----	10	Very limited Depth to bedrock Seepage, bottom layer Large stones Slope	1.00 1.00 1.00 0.16	Very limited Depth to hard bedrock Organic matter content Seepage Large stones Slope	1.00 1.00 1.00 1.00 1.00 1.00
Wahlsten, very stony	5	Very limited Depth to saturated zone Depth to bedrock Seepage, bottom layer	1.00 1.00 1.00	Very limited Depth to hard bedrock Organic matter content Depth to saturated zone Seepage Slope	1.00 1.00 1.00 1.00 0.32
Metonga, very stony, skeletal----	5	Very limited Depth to bedrock Seepage, bottom layer Large stones	1.00 1.00 0.10	Very limited Depth to hard bedrock Seepage Slope Large stones	1.00 1.00 1.00 0.99
Baudette-----	5	Very limited Depth to saturated zone Slow water movement	1.00 1.00	Very limited Depth to saturated zone Seepage Slope	1.00 0.53 0.08
Aquepts, stony, moderately slow Ksat-----	4	Very limited Ponding Depth to saturated zone Slow water movement	1.00 1.00 1.00	Very limited Ponding Organic matter content Depth to saturated zone Seepage	1.00 1.00 1.00 0.53
Rock outcrop-----	1	Not rated		Not rated	
2srqw: Wahlsten, very stony	26	Very limited Depth to saturated zone Depth to bedrock Seepage, bottom layer	1.00 1.00 1.00	Very limited Depth to hard bedrock Organic matter content Depth to saturated zone Seepage Slope	1.00 1.00 1.00 1.00 0.32

Soil Survey of Voyageurs National Park, Minnesota

Table 13.—Sewage Disposal—Continued

Map unit symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srqw: Spoonerville-----	24	Very limited Depth to saturated zone Slow water movement	1.00  1.00	Very limited Organic matter content Depth to saturated zone Seepage	1.00  1.00 0.53
Voyageurs-----	22	Very limited Depth to saturated zone Slow water movement Seepage, bottom layer Depth to bedrock	1.00  1.00 1.00 0.50	Very limited Organic matter content Depth to saturated zone Seepage Slope Depth to hard bedrock	1.00  1.00 1.00  0.08
Insula, very stony, skeletal-----	10	Very limited Depth to bedrock Seepage, bottom layer Large stones	1.00 1.00 1.00	Very limited Depth to hard bedrock Organic matter content Seepage Large stones Slope	1.00  1.00 1.00 1.00 0.68
Dishno, very stony, skeletal-----	9	Very limited Depth to saturated zone Seepage, bottom layer Depth to bedrock	1.00 1.00 0.81	Very limited Depth to saturated zone Seepage Slope Depth to hard bedrock	1.00 1.00 0.68 0.50
Aquepts, stony, moderately slow Ksat-----	3	Very limited Ponding Depth to saturated zone Slow water movement	1.00 1.00 1.00	Very limited Ponding Organic matter content Depth to saturated zone Seepage	1.00 1.00 1.00 0.53
Little Swan-----	3	Very limited Depth to saturated zone Slow water movement	1.00 1.00	Very limited Depth to saturated zone Seepage	1.00 0.53
Aquepts, very rubbly	2	Very limited Ponding Depth to saturated zone Slow water movement Large stones	1.00 1.00 1.00 0.89	Very limited Ponding Depth to saturated zone Large stones Seepage	1.00 1.00 1.00 0.53
Rock outcrop-----	1	Not rated		Not rated	

Soil Survey of Voyageurs National Park, Minnesota

Table 13.—Sewage Disposal—Continued

Map unit symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srqy: Baudette-----	40	Very limited Depth to saturated zone Slow water movement	1.00 1.00	Very limited Depth to saturated zone Seepage Slope	1.00 0.53 0.32
Little Swan-----	35	Very limited Depth to saturated zone Slow water movement	1.00 1.00	Very limited Depth to saturated zone Seepage	1.00 0.53
Voyageurs-----	10	Very limited Depth to saturated zone Slow water movement Seepage, bottom layer Depth to bedrock	1.00 1.00 1.00 0.50	Very limited Organic matter content Depth to saturated zone Seepage Slope Depth to hard bedrock	1.00 1.00 1.00 0.08 0.08
Wahlsten, very stony	5	Very limited Depth to saturated zone Depth to bedrock Seepage, bottom layer	1.00 1.00 1.00	Very limited Depth to hard bedrock Organic matter content Depth to saturated zone Seepage Slope	1.00 1.00 1.00 1.00 0.32
Insula, very stony, skeletal-----	5	Very limited Depth to bedrock Seepage, bottom layer Large stones	1.00 1.00 1.00	Very limited Depth to hard bedrock Organic matter content Seepage Large stones Slope	1.00 1.00 1.00 1.00 0.92
Spooner-----	5	Very limited Depth to saturated zone Slow water movement	1.00 1.00	Very limited Organic matter content Depth to saturated zone Seepage	1.00 1.00 0.53
2srqz: Canthook-----	30	Very limited Depth to saturated zone Slow water movement	1.00 1.00	Very limited Depth to saturated zone Slope	1.00 0.32
Durkeelake-----	30	Very limited Depth to saturated zone Slow water movement	1.00 1.00	Very limited Seepage Slope Depth to saturated zone	1.00 1.00 0.78



# Soil Survey of Voyageurs National Park, Minnesota

Table 13.—Sewage Disposal—Continued

Map unit symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srqz: Bootleg-----	10	Very limited Depth to saturated zone Slow water movement	1.00 1.00	Very limited Organic matter content Seepage Depth to saturated zone	1.00 1.00 1.00
Udipsamments-----	10	Very limited Filtering capacity Seepage, bottom layer	1.00 1.00	Very limited Seepage Slope	1.00 1.00
Grytal-----	10	Very limited Depth to saturated zone Filtering capacity Seepage, bottom layer	1.00 1.00 1.00	Very limited Seepage Depth to saturated zone	1.00 1.00
Voyageurs-----	5	Very limited Depth to saturated zone Slow water movement Seepage, bottom layer Depth to bedrock	1.00 1.00 1.00 0.50	Very limited Organic matter content Depth to saturated zone Seepage Slope Depth to hard bedrock	1.00 1.00 1.00 0.08 0.08
Aquepts, stony, moderately slow Ksat-----	5	Very limited Ponding Depth to saturated zone Slow water movement	1.00 1.00 1.00	Very limited Ponding Organic matter content Depth to saturated zone Seepage	1.00 1.00 1.00 0.53
2srr3: Spoonier-----	40	Very limited Depth to saturated zone Slow water movement	1.00 1.00	Very limited Organic matter content Depth to saturated zone Seepage	1.00 1.00 0.53
Sax-----	35	Very limited Ponding Depth to saturated zone Slow water movement	1.00 1.00 0.47	Very limited Ponding Organic matter content Depth to saturated zone Seepage	1.00 1.00 1.00 0.53

Soil Survey of Voyageurs National Park, Minnesota

Table 13.—Sewage Disposal—Continued

Map unit symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srr3: Spooner, till/bedrock substratum-----	5	Very limited Depth to saturated zone Slow water movement Depth to bedrock	1.00 1.00 0.99	Very limited Organic matter content Depth to saturated zone Depth to hard bedrock Seepage	1.00 1.00 0.99 0.53
Foglake-----	5	Very limited Depth to saturated zone Slow water movement	1.00 1.00	Very limited Organic matter content Depth to saturated zone Seepage	1.00 1.00 0.53
Littleswan-----	5	Very limited Depth to saturated zone Slow water movement	1.00 1.00	Very limited Depth to saturated zone Seepage	1.00 0.53
Bootleg-----	5	Very limited Depth to saturated zone Slow water movement	1.00 1.00	Very limited Organic matter content Seepage Depth to saturated zone	1.00 1.00 1.00
Canthook-----	5	Very limited Depth to saturated zone Slow water movement	1.00 1.00	Very limited Depth to saturated zone	1.00
2srr4: Littleswan-----	40	Very limited Depth to saturated zone Slow water movement	1.00 1.00	Very limited Depth to saturated zone Seepage	1.00 0.53
Spooner-----	25	Very limited Depth to saturated zone Slow water movement	1.00 1.00	Very limited Organic matter content Depth to saturated zone Seepage	1.00 1.00 0.53
Voyageurs-----	10	Very limited Depth to saturated zone Slow water movement Seepage, bottom layer Depth to bedrock	1.00 1.00 1.00 0.50	Very limited Organic matter content Depth to saturated zone Seepage Slope Depth to hard bedrock	1.00 1.00 1.00 0.08 0.08

Soil Survey of Voyageurs National Park, Minnesota

Table 13.—Sewage Disposal—Continued

Map unit symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srr4: Spoooner, till/bedrock substratum-----	5	Very limited Depth to saturated zone Slow water movement Depth to bedrock	1.00 1.00 0.99	Very limited Organic matter content Depth to saturated zone Depth to hard bedrock Seepage	1.00 1.00 0.99 0.53
Sax-----	5	Very limited Ponding Depth to saturated zone Slow water movement	1.00 1.00 0.47	Very limited Ponding Organic matter content Depth to saturated zone Seepage	1.00 1.00 1.00 0.53
Foglake-----	5	Very limited Depth to saturated zone Slow water movement	1.00 1.00	Very limited Organic matter content Depth to saturated zone Seepage	1.00 1.00 0.53
Bootleg-----	5	Very limited Depth to saturated zone Slow water movement	1.00 1.00	Very limited Organic matter content Seepage Depth to saturated zone	1.00 1.00 1.00
Canthook-----	5	Very limited Depth to saturated zone Slow water movement	1.00 1.00	Very limited Depth to saturated zone	1.00
2srr7: Mooselake-----	80	Very limited Ponding Depth to saturated zone Filtering capacity Seepage, bottom layer Subsidence	1.00 1.00 1.00 1.00 1.00	Very limited Ponding Organic matter content Seepage Depth to saturated zone	1.00 1.00 1.00 1.00
Tacoosh, moat-----	10	Very limited Ponding Depth to saturated zone Slow water movement	1.00 1.00 1.00	Very limited Ponding Organic matter content Seepage Depth to saturated zone	1.00 1.00 1.00 1.00

Soil Survey of Voyageurs National Park, Minnesota

Table 13.—Sewage Disposal—Continued

Map unit symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srr7: Rifle-----	5	Very limited Ponding Depth to saturated zone Filtering capacity Seepage, bottom layer Subsidence	 1.00 1.00 1.00 1.00 1.00	Very limited Ponding Organic matter content Seepage Depth to saturated zone	 1.00 1.00 1.00 1.00
Cathro, moat-----	5	Very limited Ponding Depth to saturated zone Slow water movement	 1.00 1.00 1.00	Very limited Ponding Organic matter content Depth to saturated zone Seepage	 1.00 1.00 1.00 1.00
2srr8: Rifle-----	80	Very limited Ponding Depth to saturated zone Filtering capacity Seepage, bottom layer Subsidence	 1.00 1.00 1.00 1.00 1.00	Very limited Ponding Organic matter content Seepage Depth to saturated zone	 1.00 1.00 1.00 1.00
Tacoosh, moat-----	10	Very limited Ponding Depth to saturated zone Slow water movement	 1.00 1.00 1.00	Very limited Ponding Organic matter content Seepage Depth to saturated zone	 1.00 1.00 1.00 1.00
Greenwood-----	5	Very limited Depth to saturated zone Filtering capacity Seepage, bottom layer Subsidence	 1.00 1.00 1.00 1.00	Very limited Organic matter content Seepage Depth to saturated zone	 1.00 1.00 1.00
Aquepts, stony, moderately slow Ksat-----	5	Very limited Ponding Depth to saturated zone Slow water movement	 1.00 1.00 1.00	Very limited Ponding Organic matter content Depth to saturated zone Seepage	 1.00 1.00 1.00 0.53

Soil Survey of Voyageurs National Park, Minnesota

Table 13.—Sewage Disposal—Continued

Map unit symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srr9: Tacoosh, frequently flooded-----	40	Very limited Flooding Depth to saturated zone Slow water movement	1.00 1.00 1.00	Very limited Flooding Organic matter content Seepage Depth to saturated zone	1.00 1.00 1.00 1.00
Sax, frequently flooded-----	35	Very limited Flooding Depth to saturated zone Slow water movement	1.00 1.00 0.47	Very limited Flooding Organic matter content Depth to saturated zone Seepage	1.00 1.00 1.00 0.53
Cathro, frequently flooded-----	10	Very limited Flooding Depth to saturated zone Slow water movement	1.00 1.00 1.00	Very limited Flooding Organic matter content Depth to saturated zone Seepage	1.00 1.00 1.00 1.00
Rifle, frequently flooded-----	10	Very limited Flooding Depth to saturated zone Slow water movement Subsidence	1.00 1.00 1.00 1.00	Very limited Flooding Organic matter content Seepage Depth to saturated zone	1.00 1.00 1.00 1.00
Hassman, frequently flooded-----	5	Very limited Flooding Depth to saturated zone Slow water movement	1.00 1.00 1.00	Very limited Flooding Organic matter content Depth to saturated zone	1.00 1.00 1.00
2srrb: Aguents, ponded-----	30	Very limited Ponding Depth to saturated zone Slow water movement	1.00 1.00 0.47	Very limited Ponding Organic matter content Depth to saturated zone Seepage	1.00 1.00 1.00 0.53
Sax, ponded-----	25	Very limited Ponding Depth to saturated zone Slow water movement	1.00 1.00 0.47	Very limited Ponding Organic matter content Depth to saturated zone Seepage	1.00 1.00 1.00 0.53

Soil Survey of Voyageurs National Park, Minnesota

Table 13.—Sewage Disposal—Continued

Map unit symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srrb: Tacoosh, ponded-----	25	Very limited Ponding Depth to saturated zone Slow water movement	1.00 1.00 1.00	Very limited Ponding Organic matter content Seepage Depth to saturated zone	1.00 1.00 1.00 1.00
Rifle, ponded-----	10	Very limited Ponding Depth to saturated zone Slow water movement Subsidence	1.00 1.00 1.00 1.00	Very limited Ponding Organic matter content Seepage Depth to saturated zone	1.00 1.00 1.00 1.00
Hassman, ponded-----	10	Very limited Ponding Depth to saturated zone Slow water movement	1.00 1.00 1.00	Very limited Ponding Organic matter content Depth to saturated zone	1.00 1.00 1.00
2srrh: Greenwood, seasonally ponded--	80	Very limited Ponding Depth to saturated zone Filtering capacity Seepage, bottom layer Subsidence	1.00 1.00 1.00 1.00 1.00	Very limited Ponding Organic matter content Seepage Depth to saturated zone	1.00 1.00 1.00 1.00
Merwin, seasonally ponded-----	10	Very limited Ponding Depth to saturated zone Slow water movement Subsidence	1.00 1.00 1.00 1.00	Very limited Ponding Organic matter content Seepage Depth to saturated zone	1.00 1.00 1.00 1.00
Rifle, seasonally ponded-----	5	Very limited Ponding Depth to saturated zone Filtering capacity Seepage, bottom layer Subsidence	1.00 1.00 1.00 1.00 1.00	Very limited Ponding Organic matter content Seepage Depth to saturated zone	1.00 1.00 1.00 1.00



Soil Survey of Voyageurs National Park, Minnesota

Table 13.—Sewage Disposal—Continued

Map unit symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srrh: Tacoosh, seasonally ponded-----	5	Very limited Ponding Depth to saturated zone Slow water movement	1.00 1.00 1.00	Very limited Ponding Organic matter content Seepage Depth to saturated zone	1.00 1.00 1.00 1.00
2srrj: Rifle, seasonally ponded-----	80	Very limited Ponding Depth to saturated zone Subsidence Seepage, bottom layer	1.00 1.00 1.00 1.00	Very limited Ponding Organic matter content Seepage Depth to saturated zone	1.00 1.00 1.00 1.00
Tacoosh, seasonally ponded-----	10	Very limited Ponding Depth to saturated zone Slow water movement	1.00 1.00 1.00	Very limited Ponding Organic matter content Seepage Depth to saturated zone	1.00 1.00 1.00 1.00
Greenwood, seasonally ponded--	5	Very limited Ponding Depth to saturated zone Filtering capacity Seepage, bottom layer Subsidence	1.00 1.00 1.00 1.00 1.00	Very limited Ponding Organic matter content Seepage Depth to saturated zone	1.00 1.00 1.00 1.00
Aquepts, stony, moderately slow Ksat-----	5	Very limited Ponding Depth to saturated zone Slow water movement	1.00 1.00 1.00	Very limited Ponding Organic matter content Depth to saturated zone Seepage	1.00 1.00 1.00 0.53
2srrk: Insula, very stony, skeletal-----	30	Very limited Depth to bedrock Seepage, bottom layer Slope Large stones	1.00 1.00 1.00 1.00	Very limited Depth to hard bedrock Organic matter content Seepage Large stones Slope	1.00 1.00 1.00 1.00 1.00

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Table 13.—Sewage Disposal—Continued

Map unit symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srrk: Conic, very stony, skeletal-----	16	Very limited Seepage, bottom layer Depth to bedrock Large stones	1.00 1.00 0.61	Very limited Depth to hard bedrock Seepage Slope Large stones	1.00 1.00 1.00 1.00
Wahlsten, very stony	15	Very limited Depth to saturated zone Depth to bedrock Seepage, bottom layer	1.00 1.00 1.00	Very limited Depth to hard bedrock Organic matter content Depth to saturated zone Seepage Slope	1.00 1.00 1.00 1.00 0.32
Quetico, very stony, skeletal----	10	Very limited Depth to bedrock Seepage, bottom layer Slope Large stones	1.00 1.00 1.00 1.00	Very limited Depth to hard bedrock Slope Large stones	1.00 1.00 1.00 1.00
Metonga, very stony, skeletal----	9	Very limited Depth to bedrock Seepage, bottom layer Large stones	1.00 1.00 0.10	Very limited Depth to hard bedrock Seepage Slope Large stones	1.00 1.00 1.00 1.00 0.99
Dishno, very stony, skeletal-----	9	Very limited Depth to saturated zone Seepage, bottom layer Depth to bedrock	1.00 1.00 1.00 0.81	Very limited Depth to saturated zone Seepage Slope Depth to hard bedrock	1.00 1.00 1.00 0.68 0.50
Aquepts, very rubbly	3	Very limited Ponding Depth to saturated zone Slow water movement Large stones	1.00 1.00 1.00 1.00 0.89	Very limited Ponding Depth to saturated zone Large stones Seepage	1.00 1.00 1.00 1.00 0.53
Aquepts, stony, moderately slow Ksat-----	2	Very limited Ponding Depth to saturated zone Slow water movement	1.00 1.00 1.00	Very limited Ponding Organic matter content Depth to saturated zone Seepage	1.00 1.00 1.00 1.00 0.53

Soil Survey of Voyageurs National Park, Minnesota

Table 13.—Sewage Disposal—Continued

Map unit symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srrk: Voyageurs-----	2	Very limited Depth to saturated zone Slow water movement Seepage, bottom layer Depth to bedrock	1.00 1.00 1.00 0.50	Very limited Organic matter content Depth to saturated zone Seepage Depth to hard bedrock	1.00 1.00 1.00 0.08
Rock outcrop-----	2	Not rated		Not rated	
Foglake-----	1	Very limited Depth to saturated zone Slow water movement	1.00 1.00	Very limited Organic matter content Depth to saturated zone Seepage	1.00 1.00 0.53
Eaglesnest, very stony-----	1	Very limited Depth to saturated zone Slow water movement Slope	1.00 1.00 0.16	Very limited Seepage Slope Depth to saturated zone	1.00 1.00 0.75
2srsl: Tacoosh, occasionally flooded-----	40	Very limited Flooding Depth to saturated zone Slow water movement	1.00 1.00 1.00	Very limited Flooding Organic matter content Seepage Depth to saturated zone	1.00 1.00 1.00 1.00
Sax, occasionally flooded-----	35	Very limited Flooding Depth to saturated zone Slow water movement	1.00 1.00 0.47	Very limited Flooding Organic matter content Depth to saturated zone Seepage	1.00 1.00 1.00 0.53
Cathro, occasionally flooded-----	10	Very limited Flooding Depth to saturated zone Slow water movement	1.00 1.00 1.00	Very limited Flooding Organic matter content Depth to saturated zone Seepage	1.00 1.00 1.00 1.00

Soil Survey of Voyageurs National Park, Minnesota

Table 13.—Sewage Disposal—Continued

Map unit symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srrl: Rifle, occasionally flooded-----	10	Very limited Flooding Depth to saturated zone Slow water movement Subsidence	1.00 1.00 1.00 1.00	Very limited Flooding Organic matter content Seepage Depth to saturated zone	1.00 1.00 1.00 1.00
Hassman, occasionally flooded-----	5	Very limited Flooding Depth to saturated zone Slow water movement	1.00 1.00 1.00	Very limited Flooding Organic matter content Depth to saturated zone	1.00 1.00 1.00
2srrm: Brickton-----	40	Very limited Depth to saturated zone Slow water movement	1.00 1.00	Very limited Organic matter content Depth to saturated zone Seepage	1.00 1.00 0.53
Hassman-----	35	Very limited Ponding Depth to saturated zone Slow water movement	1.00 1.00 1.00	Very limited Ponding Organic matter content Depth to saturated zone	1.00 1.00 1.00
Spooner, till/bedrock substratum-----	5	Very limited Depth to saturated zone Slow water movement Depth to bedrock	1.00 1.00 0.99	Very limited Organic matter content Depth to saturated zone Depth to hard bedrock Seepage	1.00 1.00 0.99 0.53
Foglake-----	5	Very limited Depth to saturated zone Slow water movement	1.00 1.00	Very limited Organic matter content Depth to saturated zone Seepage	1.00 1.00 0.53
Dalbo-----	5	Very limited Depth to saturated zone Slow water movement	1.00 1.00	Very limited Organic matter content Depth to saturated zone Seepage	1.00 1.00 0.53

# Soil Survey of Voyageurs National Park, Minnesota

Table 13.—Sewage Disposal—Continued

Map unit symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srrm: Bootleg-----	5	Very limited Depth to saturated zone Slow water movement	1.00 1.00	Very limited Organic matter content Seepage Depth to saturated zone	1.00 1.00 1.00
Tacoosh-----	5	Very limited Ponding Depth to saturated zone Slow water movement	1.00 1.00 1.00	Very limited Ponding Organic matter content Seepage Depth to saturated zone	1.00 1.00 1.00 1.00
2srrn: Brickton-----	60	Very limited Depth to saturated zone Slow water movement	1.00 1.00	Very limited Organic matter content Depth to saturated zone Seepage	1.00 1.00 0.53
Dalbo-----	15	Very limited Depth to saturated zone Slow water movement	1.00 1.00	Very limited Organic matter content Depth to saturated zone Seepage Slope	1.00 1.00 0.53 0.08
Voyageurs-----	5	Very limited Depth to saturated zone Slow water movement Seepage, bottom layer Depth to bedrock	1.00 1.00 1.00 0.50	Very limited Organic matter content Depth to saturated zone Seepage Slope Depth to hard bedrock	1.00 1.00 1.00 0.08 0.08
Foglake-----	5	Very limited Depth to saturated zone Slow water movement	1.00 1.00	Very limited Organic matter content Depth to saturated zone Seepage	1.00 1.00 0.53
Spooner, till/bedrock substratum-----	5	Very limited Depth to saturated zone Slow water movement Depth to bedrock	1.00 1.00 0.99	Very limited Organic matter content Depth to saturated zone Depth to hard bedrock Seepage	1.00 1.00 0.99 0.53

Soil Survey of Voyageurs National Park, Minnesota

Table 13.—Sewage Disposal—Continued

Map unit symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srrn: Bootleg-----	5	Very limited Depth to saturated zone Slow water movement	1.00 1.00	Very limited Organic matter content Seepage Depth to saturated zone	1.00 1.00 1.00
Hassman-----	5	Very limited Ponding Depth to saturated zone Slow water movement	1.00 1.00 1.00	Very limited Ponding Organic matter content Depth to saturated zone	1.00 1.00 1.00
2srrq: Cathro, ponded-----	60	Very limited Ponding Depth to saturated zone Slow water movement	1.00 1.00 1.00	Very limited Ponding Organic matter content Depth to saturated zone Seepage	1.00 1.00 1.00 1.00
Tacoosh, ponded-----	30	Very limited Ponding Depth to saturated zone Slow water movement	1.00 1.00 1.00	Very limited Ponding Organic matter content Seepage Depth to saturated zone	1.00 1.00 1.00 1.00
Sax, ponded-----	5	Very limited Ponding Depth to saturated zone Slow water movement	1.00 1.00 0.47	Very limited Ponding Organic matter content Depth to saturated zone Seepage	1.00 1.00 1.00 0.53
Aquepts, stony, moderately slow Ksat-----	5	Very limited Ponding Depth to saturated zone Slow water movement	1.00 1.00 1.00	Very limited Ponding Organic matter content Depth to saturated zone Seepage	1.00 1.00 1.00 0.53
2srrr: Insula, very stony, skeletal-----	30	Very limited Depth to bedrock Seepage, bottom layer Large stones	1.00 1.00 1.00	Very limited Depth to hard bedrock Organic matter content Seepage Large stones Slope	1.00 1.00 1.00 1.00 0.92



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Table 13.—Sewage Disposal—Continued

Map unit symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srrr: Voyageurs-----	20	Very limited Depth to saturated zone Slow water movement Seepage, bottom layer Depth to bedrock	1.00 1.00 1.00 1.00 0.50	Very limited Organic matter content Depth to saturated zone Seepage Slope Depth to hard bedrock	1.00 1.00 1.00 0.08 0.08
Wahlsten, very stony	15	Very limited Depth to saturated zone Depth to bedrock Seepage, bottom layer	1.00 1.00 1.00	Very limited Depth to hard bedrock Organic matter content Depth to saturated zone Seepage Slope	1.00 1.00 1.00 1.00 0.32
Conic, very stony, skeletal-----	10	Very limited Seepage, bottom layer Depth to bedrock Large stones	1.00 1.00 0.61	Very limited Depth to hard bedrock Seepage Large stones Slope	1.00 1.00 1.00 0.92
Spooner, till/bedrock substratum-----	8	Very limited Depth to saturated zone Slow water movement Depth to bedrock	1.00 1.00 0.99	Very limited Organic matter content Depth to saturated zone Depth to hard bedrock Seepage	1.00 1.00 0.99 0.53
Brickton-----	5	Very limited Depth to saturated zone Slow water movement	1.00 1.00	Very limited Organic matter content Depth to saturated zone Seepage	1.00 1.00 0.53
Dishno, very stony, skeletal-----	5	Very limited Depth to saturated zone Seepage, bottom layer Depth to bedrock	1.00 1.00 0.81	Very limited Depth to saturated zone Seepage Slope Depth to hard bedrock	1.00 1.00 0.68 0.50

Soil Survey of Voyageurs National Park, Minnesota

Table 13.—Sewage Disposal—Continued

Map unit symbol and soil name	Pct. of map unit	Septic tank absorption fields		Sewage lagoons	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srrr: Aquepts, very rubbly	3	Very limited Ponding Depth to saturated zone Slow water movement Large stones	1.00 1.00 1.00 0.89	Very limited Ponding Depth to saturated zone Large stones Seepage	1.00 1.00 1.00 0.53
Aquepts, stony, moderately slow Ksat-----	2	Very limited Ponding Depth to saturated zone Slow water movement	1.00 1.00 1.00	Very limited Ponding Organic matter content Depth to saturated zone Seepage	1.00 1.00 1.00 0.53
Rock outcrop-----	2	Not rated		Not rated	
2srtr: Bowstring, frequently flooded	50	Very limited Flooding Depth to saturated zone Subsidence Slow water movement	1.00 1.00 1.00 0.47	Very limited Flooding Organic matter content Depth to saturated zone Seepage	1.00 1.00 1.00 1.00
Fluvaquents, frequently flooded	40	Very limited Flooding Depth to saturated zone Seepage, bottom layer Slow water movement	1.00 1.00 1.00 0.47	Very limited Flooding Organic matter content Depth to saturated zone Seepage	1.00 1.00 1.00 1.00
Cathro, frequently flooded-----	10	Very limited Flooding Depth to saturated zone Slow water movement	1.00 1.00 1.00	Very limited Flooding Organic matter content Depth to saturated zone Seepage	1.00 1.00 1.00 1.00
W: Water-----	100	Not rated		Not rated	

# Soil Survey of Voyageurs National Park, Minnesota

Table 14.—Source of Gravel and Sand

(Onsite investigation may be needed to validate the interpretations in this table and to confirm the identity of the soil on a given site. The ratings given for the thickest layer are for the thickest layer above and excluding the bottom layer. The numbers in the value columns range from 0.00 to 0.99. The greater the value, the greater the likelihood that the bottom layer or thickest layer of the soil is a source of sand or gravel. See text for further explanation of ratings in this table)

Map unit symbol and soil name	Pct. of map unit	Gravel source		Sand source	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srmd: Quetico, bouldery---	35	Poor Bottom layer Thickest layer	0.00 0.00	Fair Bottom layer Thickest layer	0.03 0.08
Insula, bouldery----	20	Poor Bottom layer Thickest layer	0.00 0.00	Fair Bottom layer Thickest layer	0.03 0.09
Rock outcrop-----	15	Not rated		Not rated	
Wahlsten, bouldery, skeletal-----	10	Poor Thickest layer Bottom layer	0.00 0.00	Fair Bottom layer Thickest layer	0.03 0.10
Conic, bouldery, skeletal-----	10	Poor Thickest layer Bottom layer	0.00 0.00	Fair Bottom layer Thickest layer	0.05 0.10
Arcadian, very stony	10	Poor Bottom layer Thickest layer	0.00 0.00	Fair Bottom layer Thickest layer	0.02 0.08
2srqm: Quetico, bouldery---	40	Poor Bottom layer Thickest layer	0.00 0.00	Fair Bottom layer Thickest layer	0.03 0.08
Insula, bouldery----	25	Poor Bottom layer Thickest layer	0.00 0.00	Fair Bottom layer Thickest layer	0.03 0.09
Rock outcrop-----	15	Not rated		Not rated	
Conic, bouldery, skeletal-----	10	Poor Thickest layer Bottom layer	0.00 0.00	Fair Bottom layer Thickest layer	0.05 0.10
Arcadian, very stony	10	Poor Bottom layer Thickest layer	0.00 0.00	Fair Bottom layer Thickest layer	0.02 0.08
2srqn: Insula, very bouldery, skeletal	35	Poor Thickest layer Bottom layer	0.00 0.00	Fair Bottom layer Thickest layer	0.00 0.07

# Soil Survey of Voyageurs National Park, Minnesota

Table 14.—Source of Gravel and Sand—Continued

Map unit symbol and soil name	Pct. of map unit	Gravel source		Sand source	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srqn: Conic, very bouldery, skeletal	16	Poor Thickest layer Bottom layer	0.00 0.00	Fair Bottom layer Thickest layer	0.00 0.06
Rock outcrop-----	15	Not rated		Not rated	
Metonga, very stony, skeletal----	14	Poor Bottom layer Thickest layer	0.00 0.00	Fair Bottom layer Thickest layer	0.02 0.08
Quetico, very bouldery, skeletal	10	Poor Bottom layer Thickest layer	0.00 0.00	Fair Thickest layer Bottom layer	0.00 0.02
Wahlsten, very stony	5	Poor Bottom layer Thickest layer	0.00 0.00	Fair Bottom layer Thickest layer	0.03 0.08
Voyageurs-----	3	Poor Bottom layer Thickest layer	0.00 0.00	Fair Thickest layer Bottom layer	0.00 0.09
Aquepts, very rubbly	2	Poor Bottom layer Thickest layer	0.00 0.00	Fair Bottom layer Thickest layer	0.02 0.03
2srqp: Quetico, very bouldery, skeletal	31	Poor Bottom layer Thickest layer	0.00 0.00	Fair Thickest layer Bottom layer	0.00 0.02
Insula, very bouldery, skeletal	30	Poor Thickest layer Bottom layer	0.00 0.00	Fair Bottom layer Thickest layer	0.00 0.07
Greenwood-----	15	Poor Bottom layer Thickest layer Organic matter content	0.00 0.00 0.00	Poor Bottom layer Thickest layer Organic matter content	0.00 0.00 0.00
Rock outcrop-----	9	Not rated		Not rated	
Merwin-----	5	Poor Bottom layer Thickest layer	0.00 0.00	Poor Bottom layer Thickest layer	0.00 0.00
Aquepts, very rubbly	5	Poor Bottom layer Thickest layer	0.00 0.00	Fair Bottom layer Thickest layer	0.02 0.03
Wahlsten, very stony	3	Poor Bottom layer Thickest layer	0.00 0.00	Fair Bottom layer Thickest layer	0.03 0.08

# Soil Survey of Voyageurs National Park, Minnesota

Table 14.—Source of Gravel and Sand—Continued

Map unit symbol and soil name	Pct. of map unit	Gravel source		Sand source	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srqp: Conic, very bouldery, skeletal	2	Poor Thickest layer Bottom layer	0.00 0.00	Fair Bottom layer Thickest layer	0.00 0.06
2srqr: Greenwood-----	80	Poor Bottom layer Thickest layer Organic matter content	0.00 0.00 0.00	Poor Bottom layer Thickest layer Organic matter content	0.00 0.00 0.00
Merwin-----	10	Poor Bottom layer Thickest layer	0.00 0.00	Poor Bottom layer Thickest layer	0.00 0.00
Rifle, moat-----	5	Poor Bottom layer Thickest layer	0.00 0.00	Poor Bottom layer Thickest layer	0.00 0.00
Tacoosh, moat-----	5	Poor Bottom layer Thickest layer	0.00 0.00	Poor Bottom layer Thickest layer	0.00 0.00
2srqs: Insula, very stony, skeletal-----	30	Poor Thickest layer Bottom layer	0.00 0.00	Fair Bottom layer Thickest layer	0.00 0.07
Conic, very stony, skeletal-----	16	Poor Thickest layer Bottom layer	0.00 0.00	Fair Bottom layer Thickest layer	0.00 0.06
Wahlsten, very stony	15	Poor Bottom layer Thickest layer	0.00 0.00	Fair Bottom layer Thickest layer	0.03 0.08
Quetico, very stony, skeletal----	10	Poor Bottom layer Thickest layer	0.00 0.00	Fair Thickest layer Bottom layer	0.00 0.02
Metonga, very stony, skeletal----	9	Poor Bottom layer Thickest layer	0.00 0.00	Fair Bottom layer Thickest layer	0.02 0.08
Dishno, very stony, skeletal-----	9	Poor Bottom layer Thickest layer	0.00 0.00	Fair Bottom layer Thickest layer	0.08 0.11
Aquepts, very rubbly	3	Poor Bottom layer Thickest layer	0.00 0.00	Fair Bottom layer Thickest layer	0.02 0.03

Soil Survey of Voyageurs National Park, Minnesota

Table 14.—Source of Gravel and Sand—Continued

Map unit symbol and soil name	Pct. of map unit	Gravel source		Sand source	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srqs: Aquepts, stony, moderately slow Ksat-----	2	Poor Bottom layer Thickest layer	0.00 0.00	Poor Bottom layer Thickest layer	0.00 0.00
Voyageurs-----	2	Poor Bottom layer Thickest layer	0.00 0.00	Fair Thickest layer Bottom layer	0.00 0.09
Rock outcrop-----	2	Not rated		Not rated	
Foglake-----	1	Poor Bottom layer Thickest layer	0.00 0.00	Poor Bottom layer Thickest layer	0.00 0.00
Eaglesnest, very stony-----	1	Poor Bottom layer Thickest layer	0.00 0.00	Fair Bottom layer Thickest layer	0.08 0.10
2srqv: Voyageurs, oxyaquic	35	Poor Thickest layer Bottom layer	0.00 0.00	Fair Thickest layer Bottom layer	0.00 0.49
Conic, very stony, skeletal-----	15	Poor Thickest layer Bottom layer	0.00 0.00	Fair Bottom layer Thickest layer	0.00 0.06
Littleswan-----	20	Poor Bottom layer Thickest layer	0.00 0.00	Poor Bottom layer Thickest layer	0.00 0.00
Insula, very stony, skeletal-----	10	Poor Thickest layer Bottom layer	0.00 0.00	Fair Bottom layer Thickest layer	0.00 0.07
Wahlsten, very stony	5	Poor Bottom layer Thickest layer	0.00 0.00	Fair Bottom layer Thickest layer	0.03 0.08
Metonga, very stony, skeletal----	5	Poor Bottom layer Thickest layer	0.00 0.00	Fair Bottom layer Thickest layer	0.02 0.08
Baudette-----	5	Poor Bottom layer Thickest layer	0.00 0.00	Poor Bottom layer Thickest layer	0.00 0.00
Aquepts, stony, moderately slow Ksat-----	4	Poor Bottom layer Thickest layer	0.00 0.00	Poor Bottom layer Thickest layer	0.00 0.00
Rock outcrop-----	1	Not rated		Not rated	



Soil Survey of Voyageurs National Park, Minnesota

Table 14.—Source of Gravel and Sand—Continued

Map unit symbol and soil name	Pct. of map unit	Gravel source		Sand source	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srqw: Wahlsten, very stony	26	Poor Bottom layer Thickest layer	 0.00 0.00	Fair Bottom layer Thickest layer	 0.03 0.08
Spooner-----	24	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
Voyageurs-----	22	Poor Bottom layer Thickest layer	 0.00 0.00	Fair Thickest layer Bottom layer	 0.00 0.09
Insula, very stony, skeletal-----	10	Poor Thickest layer Bottom layer	 0.00 0.00	Fair Bottom layer Thickest layer	 0.00 0.07
Dishno, very stony, skeletal-----	9	Poor Bottom layer Thickest layer	 0.00 0.00	Fair Bottom layer Thickest layer	 0.08 0.11
Aquepts, stony, moderately slow Ksat-----	3	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
Littleswan-----	3	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
Aquepts, very rubbly	2	Poor Bottom layer Thickest layer	 0.00 0.00	Fair Bottom layer Thickest layer	 0.02 0.03
Rock outcrop-----	1	Not rated		Not rated	
2srqy: Baudette-----	40	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
Littleswan-----	35	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
Voyageurs-----	10	Poor Bottom layer Thickest layer	 0.00 0.00	Fair Thickest layer Bottom layer	 0.00 0.09
Wahlsten, very stony	5	Poor Bottom layer Thickest layer	 0.00 0.00	Fair Bottom layer Thickest layer	 0.03 0.08
Insula, very stony, skeletal-----	5	Poor Thickest layer Bottom layer	 0.00 0.00	Fair Bottom layer Thickest layer	 0.00 0.07

Soil Survey of Voyageurs National Park, Minnesota

Table 14.—Source of Gravel and Sand—Continued

Map unit symbol and soil name	Pct. of map unit	Gravel source		Sand source	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srqy: Spooner-----	5	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
2srqz: Canthook-----	30	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
Durkeelake-----	30	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
Bootleg-----	10	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
Udipsammets-----	10	Poor Bottom layer Thickest layer	 0.00 0.00	Good Bottom layer Thickest layer	 0.40 1.00
Grytal-----	10	Poor Bottom layer Thickest layer	 0.00 0.00	Good Bottom layer Thickest layer	 0.30 1.00
Voyageurs-----	5	Poor Bottom layer Thickest layer	 0.00 0.00	Fair Thickest layer Bottom layer	 0.00 0.09
Aquepts, stony, moderately slow Ksat-----	5	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
2srr3: Spooners-----	40	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
Sax-----	35	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
Spooners, till/bedrock substratum-----	5	Poor Thickest layer Bottom layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
Foglake-----	5	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
Littleswan-----	5	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00

# Soil Survey of Voyageurs National Park, Minnesota

Table 14.—Source of Gravel and Sand—Continued

Map unit symbol and soil name	Pct. of map unit	Gravel source		Sand source	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srr3: Bootleg-----	5	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
Canthook-----	5	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
2srr4: Littleswan-----	40	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
Spooner-----	25	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
Voyageurs-----	10	Poor Bottom layer Thickest layer	 0.00 0.00	Fair Thickest layer Bottom layer	 0.00 0.09
Spooner, till/bedrock substratum-----	5	Poor Thickest layer Bottom layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
Sax-----	5	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
Foglake-----	5	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
Bootleg-----	5	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
Canthook-----	5	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
2srr7: Mooselake-----	80	Poor Bottom layer Thickest layer Organic matter content	 0.00 0.00 0.00	Poor Bottom layer Thickest layer Organic matter content	 0.00 0.00 0.00
Tacoosh, moat-----	10	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
Rifle-----	5	Poor Bottom layer Thickest layer Organic matter content	 0.00 0.00 0.00	Poor Bottom layer Thickest layer Organic matter content	 0.00 0.00 0.00

Soil Survey of Voyageurs National Park, Minnesota

Table 14.—Source of Gravel and Sand—Continued

Map unit symbol and soil name	Pct. of map unit	Gravel source		Sand source	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srr7: Cathro, moat-----	5	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
2srr8: Rifle-----	80	Poor Bottom layer Thickest layer Organic matter content	 0.00 0.00 0.00	Poor Bottom layer Thickest layer Organic matter content	 0.00 0.00 0.00
Tacoosh, moat-----	10	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
Greenwood-----	5	Poor Bottom layer Thickest layer Organic matter content	 0.00 0.00 0.00	Poor Bottom layer Thickest layer Organic matter content	 0.00 0.00 0.00
Aquepts, stony, moderately slow Ksat-----	5	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
2srr9: Tacoosh, frequently flooded-----	40	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
Sax, frequently flooded-----	35	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
Cathro, frequently flooded-----	10	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
Rifle, frequently flooded-----	10	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
Hassman, frequently flooded-----	5	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
2srrb: Aquepts, ponded-----	30	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00

# Soil Survey of Voyageurs National Park, Minnesota

Table 14.—Source of Gravel and Sand—Continued

Map unit symbol and soil name	Pct. of map unit	Gravel source		Sand source	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srrb: Sax, ponded-----	25	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
Tacoosh, ponded-----	25	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
Rifle, ponded-----	10	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
Hassman, ponded-----	10	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
2srrh: Greenwood, seasonally ponded--	80	Poor Bottom layer Thickest layer Organic matter content	 0.00 0.00 0.00	Poor Bottom layer Thickest layer Organic matter content	 0.00 0.00 0.00
Merwin, seasonally ponded-----	10	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
Rifle, seasonally ponded-----	5	Poor Bottom layer Thickest layer Organic matter content	 0.00 0.00 0.00	Poor Bottom layer Thickest layer Organic matter content	 0.00 0.00 0.00
Tacoosh, seasonally ponded-----	5	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
2srrj: Rifle, seasonally ponded-----	80	Poor Bottom layer Thickest layer Organic matter content	 0.00 0.00 0.00	Poor Bottom layer Thickest layer Organic matter content	 0.00 0.00 0.00
Tacoosh, seasonally ponded-----	10	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
Greenwood, seasonally ponded--	5	Poor Bottom layer Thickest layer Organic matter content	 0.00 0.00 0.00	Poor Bottom layer Thickest layer Organic matter content	 0.00 0.00 0.00

Soil Survey of Voyageurs National Park, Minnesota

Table 14.—Source of Gravel and Sand—Continued

Map unit symbol and soil name	Pct. of map unit	Gravel source		Sand source	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srrj: Aquepts, stony, moderately slow Ksat-----	5	Poor Bottom layer Thickest layer	0.00 0.00	Poor Bottom layer Thickest layer	0.00 0.00
2srrk: Insula, very stony, skeletal-----	30	Poor Thickest layer Bottom layer	0.00 0.00	Fair Bottom layer Thickest layer	0.00 0.07
Conic, very stony, skeletal-----	16	Poor Thickest layer Bottom layer	0.00 0.00	Fair Bottom layer Thickest layer	0.00 0.06
Wahlsten, very stony	15	Poor Bottom layer Thickest layer	0.00 0.00	Fair Bottom layer Thickest layer	0.03 0.08
Quetico, very stony, skeletal----	10	Poor Bottom layer Thickest layer	0.00 0.00	Fair Thickest layer Bottom layer	0.00 0.02
Metonga, very stony, skeletal----	9	Poor Bottom layer Thickest layer	0.00 0.00	Fair Bottom layer Thickest layer	0.02 0.08
Dishno, very stony, skeletal-----	9	Poor Bottom layer Thickest layer	0.00 0.00	Fair Bottom layer Thickest layer	0.08 0.11
Aquepts, very rubbly	3	Poor Bottom layer Thickest layer	0.00 0.00	Fair Bottom layer Thickest layer	0.02 0.03
Aquepts, stony, moderately slow Ksat-----	2	Poor Bottom layer Thickest layer	0.00 0.00	Poor Bottom layer Thickest layer	0.00 0.00
Voyageurs-----	2	Poor Bottom layer Thickest layer	0.00 0.00	Fair Thickest layer Bottom layer	0.00 0.09
Rock outcrop-----	2	Not rated		Not rated	
Foglake-----	1	Poor Bottom layer Thickest layer	0.00 0.00	Poor Bottom layer Thickest layer	0.00 0.00
Eaglesnest, very stony-----	1	Poor Bottom layer Thickest layer	0.00 0.00	Fair Bottom layer Thickest layer	0.08 0.10



# Soil Survey of Voyageurs National Park, Minnesota

Table 14.—Source of Gravel and Sand—Continued

Map unit symbol and soil name	Pct. of map unit	Gravel source		Sand source	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srrl: Tacoosh, occasionally flooded-----	40	Poor Bottom layer Thickest layer	0.00 0.00	Poor Bottom layer Thickest layer	0.00 0.00
Sax, occasionally flooded-----	35	Poor Bottom layer Thickest layer	0.00 0.00	Poor Bottom layer Thickest layer	0.00 0.00
Cathro, occasionally flooded-----	10	Poor Bottom layer Thickest layer	0.00 0.00	Poor Bottom layer Thickest layer	0.00 0.00
Rifle, occasionally flooded-----	10	Poor Bottom layer Thickest layer	0.00 0.00	Poor Bottom layer Thickest layer	0.00 0.00
Hassman, occasionally flooded-----	5	Poor Bottom layer Thickest layer	0.00 0.00	Poor Bottom layer Thickest layer	0.00 0.00
2srrm: Brickton-----	40	Poor Bottom layer Thickest layer	0.00 0.00	Poor Bottom layer Thickest layer	0.00 0.00
Hassman-----	35	Poor Bottom layer Thickest layer	0.00 0.00	Poor Bottom layer Thickest layer	0.00 0.00
Spooner, till/bedrock substratum-----	5	Poor Thickest layer Bottom layer	0.00 0.00	Poor Bottom layer Thickest layer	0.00 0.00
Foglake-----	5	Poor Bottom layer Thickest layer	0.00 0.00	Poor Bottom layer Thickest layer	0.00 0.00
Dalbo-----	5	Poor Bottom layer Thickest layer	0.00 0.00	Poor Bottom layer Thickest layer	0.00 0.00
Bootleg-----	5	Poor Bottom layer Thickest layer	0.00 0.00	Poor Bottom layer Thickest layer	0.00 0.00
Tacoosh-----	5	Poor Bottom layer Thickest layer	0.00 0.00	Poor Bottom layer Thickest layer	0.00 0.00

Soil Survey of Voyageurs National Park, Minnesota

Table 14.—Source of Gravel and Sand—Continued

Map unit symbol and soil name	Pct. of map unit	Gravel source		Sand source	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srrn: Brickton-----	60	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
Dalbo-----	15	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
Voyageurs-----	5	Poor Bottom layer Thickest layer	 0.00 0.00	Fair Thickest layer Bottom layer	 0.00 0.09
Foglake-----	5	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
Spooner, till/bedrock substratum-----	5	Poor Thickest layer Bottom layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
Bootleg-----	5	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
Hassman-----	5	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
2srrq: Cathro, ponded-----	60	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
Tacoosh, ponded-----	30	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
Sax, ponded-----	5	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
Aquepts, stony, moderately slow Ksat-----	5	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
2srrr: Insula, very stony, skeletal-----	30	Poor Thickest layer Bottom layer	 0.00 0.00	Fair Bottom layer Thickest layer	 0.00 0.07
Voyageurs-----	20	Poor Bottom layer Thickest layer	 0.00 0.00	Fair Thickest layer Bottom layer	 0.00 0.09

# Soil Survey of Voyageurs National Park, Minnesota

Table 14.—Source of Gravel and Sand—Continued

Map unit symbol and soil name	Pct. of map unit	Gravel source		Sand source	
		Rating class and limiting features	Value	Rating class and limiting features	Value
2srrr: Wahlsten, very stony	15	Poor Bottom layer Thickest layer	 0.00 0.00	Fair Bottom layer Thickest layer	 0.03 0.08
Conic, very stony, skeletal-----	10	Poor Thickest layer Bottom layer	 0.00 0.00	Fair Bottom layer Thickest layer	 0.00 0.06
Spooner, till/bedrock substratum-----	8	Poor Thickest layer Bottom layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
Brickton-----	5	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
Dishno, very stony, skeletal-----	5	Poor Bottom layer Thickest layer	 0.00 0.00	Fair Bottom layer Thickest layer	 0.08 0.11
Aquepts, very rubbly	3	Poor Bottom layer Thickest layer	 0.00 0.00	Fair Bottom layer Thickest layer	 0.02 0.03
Aquepts, stony, moderately slow Ksat-----	2	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
Rock outcrop-----	2	Not rated		Not rated	
2srtr: Bowstring, frequently flooded	50	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
Fluvaquents, frequently flooded	40	Poor Bottom layer Thickest layer	 0.00 0.00	Fair Bottom layer Thickest layer	 0.03 0.06
Cathro, frequently flooded-----	10	Poor Bottom layer Thickest layer	 0.00 0.00	Poor Bottom layer Thickest layer	 0.00 0.00
W: Water-----	100	Not rated		Not rated	

# Soil Survey of Voyageurs National Park, Minnesota

Table 15.—Source of Reclamation Material, Roadfill, and Topsoil

(Onsite investigation may be needed to validate the interpretations in this table and to confirm the identity of the soil on a given site. The numbers in the value columns range from 0.00 to 0.99. The smaller the value, the greater the limitation. See text for further explanation of ratings in this table)

Map unit symbol and soil name	Pct. of map unit	Source of reclamation material		Roadfill source		Topsoil source	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srmd: Quetico, bouldery---	35	Poor Droughty Depth to bedrock Too acid	0.00 0.00 0.50	Poor Depth to bedrock	0.00	Poor Depth to bedrock Exchange capacity Rock fragments	0.00 0.23 0.38
Insula, bouldery----	20	Poor Droughty Depth to bedrock Too acid	0.00 0.00 0.50	Poor Depth to bedrock Stones	0.00 0.95	Poor Depth to bedrock Exchange capacity Slope	0.00 0.33 0.84
Rock outcrop-----	15	Not rated		Not rated		Not rated	
Wahlsten, bouldery, skeletal-----	10	Fair Droughty Low content of organic matter Too acid	0.10 0.50 0.50	Poor Depth to bedrock Wetness Cobble content	0.00 0.53 0.79	Poor Rock fragments Wetness Exchange capacity	0.00 0.53 0.55
Conic, bouldery, skeletal-----	10	Poor Droughty Depth to bedrock Low content of organic matter	0.00 0.12 0.50	Poor Depth to bedrock Cobble content	0.00 0.49	Poor Rock fragments Depth to bedrock Exchange capacity	0.00 0.12 0.38
Arcadian, very stony	10	Poor Droughty Depth to bedrock Too acid	0.00 0.00 0.50	Poor Depth to bedrock Stones	0.00 0.90	Poor Depth to bedrock Rock fragments Slope	0.00 0.00 0.00
2srqm: Quetico, bouldery---	40	Poor Droughty Depth to bedrock Too acid	0.00 0.00 0.50	Poor Depth to bedrock Slope	0.00 0.18	Poor Depth to bedrock Slope Exchange capacity	0.00 0.00 0.23
Insula, bouldery----	25	Poor Droughty Depth to bedrock Too acid	0.00 0.00 0.50	Poor Depth to bedrock Slope Stones	0.00 0.18 0.95	Poor Depth to bedrock Slope Exchange capacity	0.00 0.00 0.33
Rock outcrop-----	15	Not rated		Not rated		Not rated	
Conic, bouldery, skeletal-----	10	Poor Droughty Depth to bedrock Low content of organic matter	0.00 0.12 0.50	Poor Depth to bedrock Cobble content	0.00 0.49	Poor Rock fragments Depth to bedrock Exchange capacity	0.00 0.12 0.38
Arcadian, very stony	10	Poor Droughty Depth to bedrock Too acid	0.00 0.00 0.50	Poor Depth to bedrock Slope Stones	0.00 0.18 0.90	Poor Depth to bedrock Rock fragments Slope	0.00 0.00 0.00

# Soil Survey of Voyageurs National Park, Minnesota

Table 15.—Source of Reclamation Material, Roadfill, and Topsoil—Continued

Map unit symbol and soil name	Pct. of map unit	Source of reclamation material		Roadfill source		Topsoil source	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srqn: Insula, very bouldery, skeletal	35	Poor Depth to bedrock Stone content Droughty	0.00 0.00 0.00	Poor Depth to bedrock Stones Cobble content	0.00 0.00 0.23	Poor Depth to bedrock Slope Rock fragments	0.00 0.00 0.01
Conic, very bouldery, skeletal	16	Poor Droughty Depth to bedrock Too acid	0.00 0.12 0.50	Poor Depth to bedrock Cobble content Stones	0.00 0.03 0.98	Poor Rock fragments Slope Depth to bedrock	0.00 0.00 0.12
Rock outcrop-----	15	Not rated		Not rated		Not rated	
Metonga, very stony, skeletal----	14	Poor Droughty Depth to bedrock Too acid	0.00 0.10 0.50	Poor Depth to bedrock Cobble content Stones	0.00 0.51 0.99	Poor Rock fragments Depth to bedrock Exchange capacity	0.00 0.10 0.53
Quetico, very bouldery, skeletal	10	Poor Droughty Depth to bedrock Stone content	0.00 0.00 0.02	Poor Depth to bedrock Cobble content Stones	0.00 0.00 0.02	Poor Depth to bedrock Rock fragments Slope	0.00 0.00 0.00
Wahlsten, very stony	5	Fair Droughty Too acid Depth to bedrock	0.01 0.50 0.61	Poor Depth to bedrock Wetness	0.00 0.53	Fair Rock fragments Wetness Depth to bedrock	0.32 0.53 0.61
Voyageurs-----	3	Poor Low content of organic matter Too acid Water erosion	0.00 0.50 0.68	Poor Wetness Dusty Depth to bedrock	0.00 0.80 0.92	Poor Wetness Hard to reclaim (rock fragments) Rock fragments	0.00 0.26 0.93
Aquepts, very rubbly	2	Poor Low content of organic matter Stone content Too acid	0.00 0.00 0.39	Poor Wetness Stones Cobble content	0.00 0.00 0.87	Poor Wetness Hard to reclaim (rock fragments) Rock fragments	0.00 0.08 0.12
2srqp: Quetico, very bouldery, skeletal	31	Poor Droughty Depth to bedrock Stone content	0.00 0.00 0.02	Poor Depth to bedrock Cobble content Stones	0.00 0.00 0.02	Poor Depth to bedrock Rock fragments Exchange capacity	0.00 0.00 0.10
Insula, very bouldery, skeletal	30	Poor Depth to bedrock Stone content Droughty	0.00 0.00 0.00	Poor Depth to bedrock Stones Cobble content	0.00 0.00 0.23	Poor Depth to bedrock Rock fragments Exchange capacity	0.00 0.01 0.28
Greenwood-----	15	Fair Too acid	0.50	Poor Wetness Low strength Dusty	0.00 0.00 0.80	Poor Wetness Organic matter content high Too acid	0.00 0.00 0.13

# Soil Survey of Voyageurs National Park, Minnesota

Table 15.—Source of Reclamation Material, Roadfill, and Topsoil—Continued

Map unit symbol and soil name	Pct. of map unit	Source of reclamation material		Roadfill source		Topsoil source	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srqp: Rock outcrop-----	9	Not rated		Not rated		Not rated	
Merwin-----	5	Poor		Poor		Poor	
		Low content of organic matter	0.00	Wetness	0.00	Wetness	0.00
		Too acid	0.50	Low strength	0.00	Too acid	0.58
		Water erosion	0.68	Dusty	0.80		
Aquepts, very rubbly	5	Poor		Poor		Poor	
		Low content of organic matter	0.00	Wetness	0.00	Wetness	0.00
		Stone content	0.00	Stones	0.00	Hard to reclaim (rock fragments)	0.08
		Too acid	0.39	Cobble content	0.87	Rock fragments	0.12
Wahlsten, very stony	3	Fair		Poor		Fair	
		Droughty	0.01	Depth to bedrock	0.00	Rock fragments	0.32
		Too acid	0.50	Wetness	0.53	Wetness	0.53
		Depth to bedrock	0.61			Depth to bedrock	0.61
Conic, very bouldery, skeletal	2	Poor		Poor		Poor	
		Droughty	0.00	Depth to bedrock	0.00	Rock fragments	0.00
		Depth to bedrock	0.12	Cobble content	0.03	Depth to bedrock	0.12
		Too acid	0.50	Stones	0.98	Exchange capacity	0.30
2srqr: Greenwood-----	80	Fair		Poor		Poor	
		Too acid	0.50	Wetness	0.00	Wetness	0.00
				Low strength	0.00	Organic matter content high	0.00
				Dusty	0.80	Too acid	0.13
Merwin-----	10	Poor		Poor		Poor	
		Low content of organic matter	0.00	Wetness	0.00	Wetness	0.00
		Too acid	0.50	Low strength	0.00	Too acid	0.58
		Water erosion	0.68	Dusty	0.80		
Rifle, moat-----	5	Fair		Poor		Poor	
		Too acid	0.32	Wetness	0.00	Wetness	0.00
				Low strength	0.00	Organic matter content high	0.00
				Dusty	0.80	Too acid	0.88
Tacoosh, moat-----	5	Fair		Poor		Poor	
		Too acid	0.21	Wetness	0.00	Wetness	0.00
				Low strength	0.00	Organic matter content high	0.00
				Dusty	0.80	Too acid	0.85
2srqs: Insula, very stony, skeletal-----	30	Poor		Poor		Poor	
		Depth to bedrock	0.00	Depth to bedrock	0.00	Depth to bedrock	0.00
		Stone content	0.00	Stones	0.00	Rock fragments	0.01
		Droughty	0.00	Cobble content	0.23	Exchange capacity	0.28



# Soil Survey of Voyageurs National Park, Minnesota

Table 15.—Source of Reclamation Material, Roadfill, and Topsoil—Continued

Map unit symbol and soil name	Pct. of map unit	Source of reclamation material		Roadfill source		Topsoil source	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srqs: Conic, very stony, skeletal-----	16	Poor Droughty Depth to bedrock Too acid	0.00 0.12 0.50	Poor Depth to bedrock Cobble content Stones	0.00 0.03 0.98	Poor Rock fragments Depth to bedrock Exchange capacity	0.00 0.12 0.30
Wahlsten, very stony	15	Fair Droughty Too acid Depth to bedrock	0.01 0.50 0.61	Poor Depth to bedrock Wetness	0.00 0.53	Fair Rock fragments Wetness Depth to bedrock	0.32 0.53 0.61
Quetico, very stony, skeletal----	10	Poor Droughty Depth to bedrock Stone content	0.00 0.00 0.02	Poor Depth to bedrock Cobble content Stones	0.00 0.00 0.02	Poor Depth to bedrock Rock fragments Exchange capacity	0.00 0.00 0.10
Metonga, very stony, skeletal----	9	Poor Droughty Depth to bedrock Too acid	0.00 0.10 0.50	Poor Depth to bedrock Cobble content Stones	0.00 0.51 0.99	Poor Rock fragments Depth to bedrock Exchange capacity	0.00 0.10 0.53
Dishno, very stony, skeletal-----	9	Fair Low content of organic matter Too acid Droughty	0.08 0.12 0.53	Fair Depth to bedrock Wetness	0.50 0.53	Poor Rock fragments Wetness Exchange capacity	0.00 0.53 0.68
Aquepts, very rubbly	3	Poor Low content of organic matter Stone content Too acid	0.00 0.00 0.39	Poor Wetness Stones Cobble content	0.00 0.00 0.87	Poor Wetness Hard to reclaim (rock fragments) Rock fragments	0.00 0.08 0.12
Aquepts, stony, moderately slow Ksat-----	2	Poor Low content of organic matter Too acid Water erosion	0.00 0.50 0.68	Poor Wetness Dusty	0.00 0.95	Poor Wetness Hard to reclaim (rock fragments)	0.00 0.89
Voyageurs-----	2	Poor Low content of organic matter Too acid Water erosion	0.00 0.50 0.68	Poor Wetness Dusty Depth to bedrock	0.00 0.80 0.92	Poor Wetness Hard to reclaim (rock fragments) Rock fragments	0.00 0.26 0.93
Rock outcrop-----	2	Not rated		Not rated		Not rated	
Foglake-----	1	Poor Low content of organic matter Too acid Too clayey	0.00 0.32 0.43	Poor Wetness Low strength Shrink-swell	0.00 0.00 0.76	Poor Wetness Too clayey	0.00 0.31

# Soil Survey of Voyageurs National Park, Minnesota

Table 15.—Source of Reclamation Material, Roadfill, and Topsoil—Continued

Map unit symbol and soil name	Pct. of map unit	Source of reclamation material		Roadfill source		Topsoil source	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srqs: Eaglesnest, very stony-----	1	Poor Low content of organic matter Too acid Droughty	0.00 0.26 0.72	Fair Wetness	0.53	Poor Rock fragments Hard to reclaim (rock fragments) Wetness	0.00 0.01 0.53
2srqv: Voyageurs, oxyaquic	35	Fair Low content of organic matter Too acid	0.32 0.50	Poor Low strength Dusty Depth to bedrock	0.00 0.80 0.82	Fair Wetness	0.89
Conic, very stony, skeletal-----	15	Poor Droughty Depth to bedrock Too acid	0.00 0.12 0.50	Poor Depth to bedrock Cobble content Stones	0.00 0.03 0.98	Poor Rock fragments Depth to bedrock Exchange capacity	0.00 0.12 0.30
Littleswan-----	20	Poor Low content of organic matter Too acid Water erosion	0.00 0.32 0.68	Poor Low strength Wetness Dusty	0.00 0.14 0.80	Fair Wetness	0.14
Insula, very stony, skeletal-----	10	Poor Depth to bedrock Stone content Droughty	0.00 0.00 0.00	Poor Depth to bedrock Stones Cobble content	0.00 0.00 0.23	Poor Depth to bedrock Rock fragments Exchange capacity	0.00 0.01 0.28
Wahlsten, very stony	5	Fair Droughty Too acid Depth to bedrock	0.01 0.50 0.61	Poor Depth to bedrock Wetness	0.00 0.53	Fair Rock fragments Wetness Depth to bedrock	0.32 0.53 0.61
Metonga, very stony, skeletal----	5	Poor Droughty Depth to bedrock Too acid	0.00 0.10 0.50	Poor Depth to bedrock Cobble content Stones	0.00 0.51 0.99	Poor Rock fragments Depth to bedrock Exchange capacity	0.00 0.10 0.53
Baudette-----	5	Poor Low content of organic matter Too acid Water erosion	0.00 0.50 0.68	Poor Low strength Dusty Wetness	0.00 0.80 0.89	Fair Wetness	0.89
Aquepts, stony, moderately slow Ksat-----	4	Poor Low content of organic matter Too acid Water erosion	0.00 0.50 0.68	Poor Wetness Dusty	0.00 0.95	Poor Wetness Hard to reclaim (rock fragments)	0.00 0.89
Rock outcrop-----	1	Not rated		Not rated		Not rated	

# Soil Survey of Voyageurs National Park, Minnesota

Table 15.—Source of Reclamation Material, Roadfill, and Topsoil—Continued

Map unit symbol and soil name	Pct. of map unit	Source of reclamation material		Roadfill source		Topsoil source	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srqw: Wahlsten, very stony	26	Fair Droughty Too acid Depth to bedrock	 0.01 0.50 0.61	Poor Depth to bedrock Wetness	 0.00 0.53	Fair Rock fragments Wetness Depth to bedrock	 0.32 0.53 0.61
Spooner-----	24	Poor Low content of organic matter Too acid Water erosion	 0.00 0.32 0.68	Poor Wetness Low strength Dusty	 0.00 0.00 0.80	Poor Wetness	 0.00
Voyageurs-----	22	Poor Low content of organic matter Too acid Water erosion	 0.00 0.50 0.68	Poor Wetness Dusty Depth to bedrock	 0.00 0.80 0.92	Poor Wetness Hard to reclaim (rock fragments) Rock fragments	 0.00 0.26 0.93
Insula, very stony, skeletal-----	10	Poor Depth to bedrock Stone content Droughty	 0.00 0.00 0.00	Poor Depth to bedrock Stones Cobble content	 0.00 0.00 0.23	Poor Depth to bedrock Rock fragments Exchange capacity	 0.00 0.01 0.28
Dishno, very stony, skeletal-----	9	Fair Low content of organic matter Too acid Droughty	 0.08 0.12 0.53	Fair Depth to bedrock Wetness	 0.50 0.53	Poor Rock fragments Wetness Exchange capacity	 0.00 0.53 0.68
Aquepts, stony, moderately slow Ksat-----	3	Poor Low content of organic matter Too acid Water erosion	 0.00 0.50 0.68	Poor Wetness Dusty	 0.00 0.95	Poor Wetness Hard to reclaim (rock fragments)	 0.00 0.89
Littleswan-----	3	Poor Low content of organic matter Too acid	 0.00 0.32	Poor Low strength Wetness Dusty	 0.00 0.14 0.80	Fair Wetness	 0.14
Aquepts, very rubbly	2	Poor Low content of organic matter Stone content Too acid	 0.00 0.00 0.39	Poor Wetness Stones Cobble content	 0.00 0.00 0.87	Poor Wetness Hard to reclaim (rock fragments) Rock fragments	 0.00 0.08 0.12
Rock outcrop-----	1	Not rated		Not rated		Not rated	
2srqy: Baudette-----	40	Poor Low content of organic matter Too acid Water erosion	 0.00 0.50 0.99	Poor Low strength Dusty Wetness	 0.00 0.80 0.89	Fair Wetness	 0.89

# Soil Survey of Voyageurs National Park, Minnesota

Table 15.—Source of Reclamation Material, Roadfill, and Topsoil—Continued

Map unit symbol and soil name	Pct. of map unit	Source of reclamation material		Roadfill source		Topsoil source	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srqy: Littleswan-----	35	Poor Low content of organic matter Too acid	0.00 0.32	Poor Low strength Wetness Dusty	0.00 0.14 0.80	Fair Wetness	0.14
Voyageurs-----	10	Poor Low content of organic matter Too acid Water erosion	0.00 0.50 0.68	Poor Wetness Dusty Depth to bedrock	0.00 0.80 0.92	Poor Wetness Hard to reclaim (rock fragments) Rock fragments	0.00 0.26 0.93
Wahlsten, very stony	5	Fair Droughty Too acid Depth to bedrock	0.01 0.50 0.61	Poor Depth to bedrock Wetness	0.00 0.53	Fair Rock fragments Wetness Depth to bedrock	0.32 0.53 0.61
Insula, very stony, skeletal-----	5	Poor Depth to bedrock Stone content Droughty	0.00 0.00 0.00	Poor Depth to bedrock Stones Cobble content	0.00 0.00 0.23	Poor Depth to bedrock Rock fragments Exchange capacity	0.00 0.01 0.28
Spooner-----	5	Poor Low content of organic matter Too acid Water erosion	0.00 0.32 0.68	Poor Wetness Low strength Dusty	0.00 0.00 0.80	Poor Wetness	0.00
2srqz: Canthook-----	30	Poor Low content of organic matter Too acid	0.00 0.50	Poor Wetness Low strength Shrink-swell	0.00 0.00 0.79	Poor Wetness	0.00
Durkeelake-----	30	Poor Low content of organic matter Too acid Water erosion	0.00 0.50 0.68	Poor Low strength Wetness	0.00 0.50	Fair Wetness Exchange capacity	0.50 0.75
Bootleg-----	10	Fair Too acid Low content of organic matter Water erosion	0.32 0.32 0.99	Poor Wetness Low strength Shrink-swell	0.00 0.00 0.83	Poor Wetness	0.00
Udipsamments-----	10	Poor Too sandy Wind erosion Low content of organic matter	0.00 0.00 0.00	Good		Poor Too sandy Exchange capacity Too acid	0.00 0.28 0.99
Grytal-----	10	Poor Too sandy Wind erosion Low content of organic matter	0.00 0.00 0.00	Fair Wetness	0.89	Poor Too sandy Exchange capacity Wetness	0.00 0.39 0.89

Soil Survey of Voyageurs National Park, Minnesota

Table 15.—Source of Reclamation Material, Roadfill, and Topsoil—Continued

Map unit symbol and soil name	Pct. of map unit	Source of reclamation material		Roadfill source		Topsoil source	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srqz: Voyageurs-----	5	Poor Low content of organic matter Too acid Water erosion	0.00 0.50 0.68	Poor Wetness Dusty Depth to bedrock	0.00 0.80 0.92	Poor Wetness Hard to reclaim (rock fragments) Rock fragments	0.00 0.26 0.93
Aquepts, stony, moderately slow Ksat-----	5	Poor Low content of organic matter Too acid Water erosion	0.00 0.50 0.68	Poor Wetness Dusty	0.00 0.95	Poor Wetness Hard to reclaim (rock fragments)	0.00 0.89
2srr3: Spooners-----	40	Poor Low content of organic matter Too acid Water erosion	0.00 0.32 0.68	Poor Wetness Low strength Dusty	0.00 0.00 0.80	Poor Wetness	0.00
Sax-----	35	Poor Wind erosion Low content of organic matter Water erosion	0.00 0.00 0.37	Poor Wetness Low strength Dusty	0.00 0.22 0.80	Poor Wetness	0.00
Spooners, till/bedrock substratum-----	5	Poor Low content of organic matter Too acid Water erosion	0.00 0.50 0.99	Poor Wetness Depth to bedrock Dusty	0.00 0.04 0.80	Poor Wetness Hard to reclaim (rock fragments)	0.00 0.98
Foglake-----	5	Poor Low content of organic matter Too acid Too clayey	0.00 0.32 0.43	Poor Wetness Low strength Shrink-swell	0.00 0.00 0.76	Poor Wetness Too clayey	0.00 0.31
Littleswan-----	5	Poor Low content of organic matter Too acid	0.00 0.32	Poor Low strength Wetness Dusty	0.00 0.14 0.80	Fair Wetness	0.14
Bootleg-----	5	Fair Too acid Low content of organic matter Water erosion	0.32 0.32 0.99	Poor Wetness Low strength Shrink-swell	0.00 0.00 0.83	Poor Wetness	0.00
Canthook-----	5	Poor Low content of organic matter Too acid	0.00 0.50	Poor Wetness Low strength Shrink-swell	0.00 0.00 0.79	Poor Wetness	0.00

# Soil Survey of Voyageurs National Park, Minnesota

Table 15.—Source of Reclamation Material, Roadfill, and Topsoil—Continued

Map unit symbol and soil name	Pct. of map unit	Source of reclamation material		Roadfill source		Topsoil source	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srr4: Littleswan-----	40	Poor Low content of organic matter Too acid	0.00 0.32	Poor Low strength Wetness Dusty	0.00 0.14 0.80	Fair Wetness	0.14
Spooner-----	25	Poor Low content of organic matter Too acid Water erosion	0.00 0.32 0.68	Poor Wetness Low strength Dusty	0.00 0.00 0.80	Poor Wetness	0.00
Voyageurs-----	10	Poor Low content of organic matter Too acid Water erosion	0.00 0.50 0.68	Poor Wetness Dusty Depth to bedrock	0.00 0.80 0.92	Poor Wetness Hard to reclaim (rock fragments) Rock fragments	0.00 0.26 0.93
Spooner, till/bedrock substratum-----	5	Poor Low content of organic matter Too acid Water erosion	0.00 0.55 0.99	Poor Wetness Depth to bedrock Dusty	0.00 0.04 0.80	Poor Wetness Hard to reclaim (rock fragments)	0.00 0.98
Sax-----	5	Poor Wind erosion Low content of organic matter Too acid	0.00 0.00 0.97	Poor Wetness Low strength Dusty	0.00 0.22 0.80	Poor Wetness	0.00
Foglake-----	5	Poor Low content of organic matter Too acid Too clayey	0.00 0.32 0.43	Poor Wetness Low strength Shrink-swell	0.00 0.00 0.76	Poor Wetness Too clayey	0.00 0.31
Bootleg-----	5	Fair Too acid Low content of organic matter Water erosion	0.32 0.32 0.99	Poor Wetness Low strength Shrink-swell	0.00 0.00 0.83	Poor Wetness	0.00
Canthook-----	5	Poor Low content of organic matter Too acid	0.00 0.50	Poor Wetness Low strength Shrink-swell	0.00 0.00 0.79	Poor Wetness	0.00
2srr7: Mooselake-----	80	Fair Too acid	0.92	Poor Wetness Low strength Dusty	0.00 0.00 0.80	Poor Wetness Organic matter content high Exchange capacity	0.00 0.00 0.98
Tacoosh, moat-----	10	Fair Too acid	0.21	Poor Wetness Low strength Dusty	0.00 0.00 0.80	Poor Wetness Organic matter content high Too acid	0.00 0.00 0.85



# Soil Survey of Voyageurs National Park, Minnesota

Table 15.—Source of Reclamation Material, Roadfill, and Topsoil—Continued

Map unit symbol and soil name	Pct. of map unit	Source of reclamation material		Roadfill source		Topsoil source	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srr7: Rifle-----	5	Fair Too acid	0.50	Poor Wetness Low strength Dusty	0.00 0.00 0.80	Poor Wetness Organic matter content high Too acid	0.00 0.00 0.84
Cathro, moat-----	5	Poor Low content of organic matter Too acid Water erosion	0.00 0.84 0.99	Poor Wetness Low strength Dusty	0.00 0.00 0.80	Poor Wetness Exchange capacity	0.00 0.97
2srr8: Rifle-----	80	Fair Too acid	0.50	Poor Wetness Low strength Dusty	0.00 0.00 0.80	Poor Wetness Organic matter content high Too acid	0.00 0.00 0.85
Tacoosh, moat-----	10	Fair Too acid	0.21	Poor Wetness Low strength Dusty	0.00 0.00 0.80	Poor Wetness Organic matter content high Too acid	0.00 0.00 0.85
Greenwood-----	5	Fair Too acid	0.50	Poor Wetness Low strength Dusty	0.00 0.00 0.80	Poor Wetness Organic matter content high Too acid	0.00 0.00 0.13
Aquepts, stony, moderately slow Ksat-----	5	Poor Low content of organic matter Too acid Water erosion	0.00 0.50 0.68	Poor Wetness Dusty	0.00 0.95	Poor Wetness Hard to reclaim (rock fragments)	0.00 0.89
2srr9: Tacoosh, frequently flooded-----	40	Fair Too acid	0.21	Poor Wetness Low strength Dusty	0.00 0.00 0.80	Poor Wetness Organic matter content high Too acid	0.00 0.00 0.85
Sax, frequently flooded-----	35	Poor Low content of organic matter Too acid	0.00 0.97	Poor Wetness Low strength Dusty	0.00 0.22 0.80	Poor Wetness	0.00
Cathro, frequently flooded-----	10	Poor Low content of organic matter Too acid Water erosion	0.00 0.84 0.99	Poor Wetness Low strength Dusty	0.00 0.00 0.80	Poor Wetness Exchange capacity	0.00 0.97

# Soil Survey of Voyageurs National Park, Minnesota

Table 15.—Source of Reclamation Material, Roadfill, and Topsoil—Continued

Map unit symbol and soil name	Pct. of map unit	Source of reclamation material		Roadfill source		Topsoil source	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srr9: Rifle, frequently flooded-----	10	Fair Too acid	0.32	Poor Wetness Low strength Dusty	0.00 0.00 0.80	Poor Wetness Organic matter content high Too acid	0.00 0.00 0.88
Hassman, frequently flooded-----	5	Fair Too acid Low content of organic matter Too clayey	0.32 0.32 0.45	Poor Wetness Low strength Shrink-swell	0.00 0.00 0.40	Poor Wetness Too clayey	0.00 0.50
2srrb: Aguents, ponded----	30	Fair Low content of organic matter	0.02	Poor Wetness Low strength Dusty	0.00 0.00 0.94	Poor Wetness Exchange capacity	0.00 0.99
Sax, ponded-----	25	Poor Wind erosion Low content of organic matter Too acid	0.00 0.00 0.97	Poor Wetness Low strength Dusty	0.00 0.22 0.80	Poor Wetness	0.00
Tacoosh, ponded----	25	Fair Too acid	0.21	Poor Wetness Low strength Dusty	0.00 0.00 0.80	Poor Wetness Organic matter content high Too acid	0.00 0.00 0.85
Rifle, ponded-----	10	Fair Too acid	0.32	Poor Wetness Low strength Dusty	0.00 0.00 0.80	Poor Wetness Organic matter content high Too acid	0.00 0.00 0.88
Hassman, ponded----	10	Fair Too acid Low content of organic matter Too clayey	0.32 0.32 0.45	Poor Wetness Low strength Shrink-swell	0.00 0.00 0.40	Poor Wetness Too clayey	0.00 0.50
2srrh: Greenwood, seasonally ponded--	80	Fair Too acid	0.50	Poor Wetness Low strength Dusty	0.00 0.00 0.80	Poor Wetness Organic matter content high Too acid	0.00 0.00 0.13
Merwin, seasonally ponded-----	10	Poor Low content of organic matter Too acid Water erosion	0.00 0.50 0.68	Poor Wetness Low strength Dusty	0.00 0.00 0.80	Poor Wetness Too acid	0.00 0.58

# Soil Survey of Voyageurs National Park, Minnesota

Table 15.—Source of Reclamation Material, Roadfill, and Topsoil—Continued

Map unit symbol and soil name	Pct. of map unit	Source of reclamation material		Roadfill source		Topsoil source	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srrh: Rifle, seasonally ponded-----	5	Fair Too acid	0.50	Poor Wetness Low strength Dusty	0.00 0.00 0.80	Poor Wetness Organic matter content high Too acid	0.00 0.00 0.84
Tacoosh, seasonally ponded-----	5	Fair Too acid	0.21	Poor Wetness Low strength Dusty	0.00 0.00 0.80	Poor Wetness Organic matter content high Too acid	0.00 0.00 0.85
2srrj: Rifle, seasonally ponded-----	80	Fair Too acid	0.21	Poor Wetness Low strength Dusty	0.00 0.00 0.80	Poor Wetness Organic matter content high Too acid	0.00 0.00 0.87
Tacoosh, seasonally ponded-----	10	Fair Too acid	0.21	Poor Wetness Low strength Dusty	0.00 0.00 0.80	Poor Wetness Organic matter content high Too acid	0.00 0.00 0.85
Greenwood, seasonally ponded--	5	Fair Too acid	0.50	Poor Wetness Low strength Dusty	0.00 0.00 0.80	Poor Wetness Organic matter content high Too acid	0.00 0.00 0.13
Aquepts, stony, moderately slow Ksat-----	5	Poor Low content of organic matter Too acid Water erosion	0.00 0.50 0.68	Poor Wetness Dusty	0.00 0.95	Poor Wetness Hard to reclaim (rock fragments)	0.00 0.89
2srrk: Insula, very stony, skeletal-----	30	Poor Depth to bedrock Stone content Droughty	0.00 0.00 0.00	Poor Depth to bedrock Stones Cobble content	0.00 0.00 0.23	Poor Depth to bedrock Slope Rock fragments	0.00 0.00 0.01
Conic, very stony, skeletal-----	16	Poor Droughty Depth to bedrock Too acid	0.00 0.12 0.50	Poor Depth to bedrock Cobble content Stones	0.00 0.03 0.98	Poor Rock fragments Depth to bedrock Exchange capacity	0.00 0.12 0.30
Wahlsten, very stony	15	Fair Droughty Too acid Depth to bedrock	0.01 0.50 0.61	Poor Depth to bedrock Wetness	0.00 0.53	Fair Rock fragments Wetness Depth to bedrock	0.32 0.53 0.61

# Soil Survey of Voyageurs National Park, Minnesota

Table 15.—Source of Reclamation Material, Roadfill, and Topsoil—Continued

Map unit symbol and soil name	Pct. of map unit	Source of reclamation material		Roadfill source		Topsoil source	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srrk: Quetico, very stony, skeletal----	10	Poor Droughty Depth to bedrock Stone content	 0.00 0.00 0.02	Poor Depth to bedrock Cobble content Stones	 0.00 0.00 0.02	Poor Depth to bedrock Rock fragments Slope	 0.00 0.00 0.00
Metonga, very stony, skeletal----	9	Poor Droughty Depth to bedrock Too acid	 0.00 0.10 0.50	Poor Depth to bedrock Cobble content Stones	 0.00 0.51 0.99	Poor Rock fragments Depth to bedrock Exchange capacity	 0.00 0.10 0.53
Dishno, very stony, skeletal-----	9	Fair Low content of organic matter Too acid Droughty	 0.08 0.12 0.53	Fair Depth to bedrock Wetness	 0.50 0.53	Poor Rock fragments Wetness Exchange capacity	 0.00 0.53 0.68
Aquepts, very rubbly	3	Poor Low content of organic matter Stone content Too acid	 0.00 0.00 0.39	Poor Wetness Stones Cobble content	 0.00 0.00 0.87	Poor Wetness Hard to reclaim (rock fragments) Rock fragments	 0.00 0.08 0.12
Aquepts, stony, moderately slow Ksat-----	2	Poor Low content of organic matter Too acid Water erosion	 0.00 0.50 0.68	Poor Wetness Dusty	 0.00 0.95	Poor Wetness Hard to reclaim (rock fragments)	 0.00 0.89
Voyageurs-----	2	Poor Low content of organic matter Too acid Water erosion	 0.00 0.50 0.68	Poor Wetness Dusty Depth to bedrock	 0.00 0.80 0.92	Poor Wetness Hard to reclaim (rock fragments) Rock fragments	 0.00 0.26 0.93
Rock outcrop-----	2	Not rated		Not rated		Not rated	
Foglake-----	1	Poor Low content of organic matter Too acid Too clayey	 0.00 0.32 0.43	Poor Wetness Low strength Shrink-swell	 0.00 0.00 0.76	Poor Wetness Too clayey	 0.00 0.31
Eaglesnest, very stony-----	1	Poor Low content of organic matter Too acid Droughty	 0.00 0.26 0.72	Fair Wetness	 0.53	Poor Rock fragments Hard to reclaim (rock fragments) Wetness	 0.00 0.01 0.53

Soil Survey of Voyageurs National Park, Minnesota

Table 15.—Source of Reclamation Material, Roadfill, and Topsoil—Continued

Map unit symbol and soil name	Pct. of map unit	Source of reclamation material		Roadfill source		Topsoil source	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2sr11: Tacoosh, occasionally flooded-----	40	Fair Too acid	0.21	Poor Wetness Low strength Dusty	0.00 0.00 0.80	Poor Wetness Organic matter content high Too acid	0.00 0.00 0.85
Sax, occasionally flooded-----	35	Poor Wind erosion Low content of organic matter Too acid	0.00 0.00 0.97	Poor Wetness Low strength Dusty	0.00 0.22 0.80	Poor Wetness	0.00
Cathro, occasionally flooded-----	10	Poor Low content of organic matter Too acid Water erosion	0.00 0.84 0.99	Poor Wetness Low strength Dusty	0.00 0.00 0.80	Poor Wetness Exchange capacity	0.00 0.97
Rifle, occasionally flooded-----	10	Fair Too acid	0.32	Poor Wetness Low strength Dusty	0.00 0.00 0.80	Poor Wetness Organic matter content high Too acid	0.00 0.00 0.88
Hassman, occasionally flooded-----	5	Fair Too acid Low content of organic matter Too clayey	0.32 0.32 0.45	Poor Wetness Low strength Shrink-swell	0.00 0.00 0.40	Poor Wetness Too clayey	0.00 0.50
2srrm: Brickton-----	40	Fair Too acid Low content of organic matter Too clayey	0.21 0.32 0.61	Poor Wetness Low strength Shrink-swell	0.00 0.00 0.34	Poor Wetness Too clayey	0.00 0.50
Hassman-----	35	Fair Too acid Low content of organic matter Too clayey	0.32 0.32 0.45	Poor Wetness Low strength Shrink-swell	0.00 0.00 0.40	Poor Wetness Too clayey	0.00 0.50
Spooner, till/bedrock substratum-----	5	Poor Low content of organic matter Too acid Water erosion	0.00 0.50 0.99	Poor Wetness Depth to bedrock Dusty	0.00 0.04 0.80	Poor Wetness Hard to reclaim (rock fragments)	0.00 0.98

# Soil Survey of Voyageurs National Park, Minnesota

Table 15.—Source of Reclamation Material, Roadfill, and Topsoil—Continued

Map unit symbol and soil name	Pct. of map unit	Source of reclamation material		Roadfill source		Topsoil source	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srrm: Foglake-----	5	Poor Low content of organic matter Too acid Too clayey	0.00 0.32 0.43	Poor Wetness Low strength Shrink-swell	0.00 0.00 0.76	Poor Wetness Too clayey	0.00 0.31
Dalbo-----	5	Poor Low content of organic matter Too acid Water erosion	0.00 0.32 0.37	Poor Wetness Low strength Shrink-swell	0.00 0.00 0.30	Poor Wetness Too clayey	0.00 0.57
Bootleg-----	5	Fair Too acid Low content of organic matter Water erosion	0.32 0.32 0.99	Poor Wetness Low strength Shrink-swell	0.00 0.00 0.83	Poor Wetness	0.00
Tacoosh-----	5	Fair Too acid	0.21	Poor Wetness Low strength Dusty	0.00 0.00 0.80	Poor Wetness Organic matter content high Too acid	0.00 0.00 0.85
2srrn: Brickton-----	60	Fair Too acid Low content of organic matter Too clayey	0.21 0.32 0.61	Poor Wetness Low strength Shrink-swell	0.00 0.00 0.34	Poor Wetness Too clayey	0.00 0.50
Dalbo-----	15	Poor Low content of organic matter Too acid Water erosion	0.00 0.32 0.37	Poor Wetness Low strength Shrink-swell	0.00 0.00 0.30	Poor Wetness Too clayey	0.00 0.57
Voyageurs-----	5	Poor Low content of organic matter Too acid Water erosion	0.00 0.50 0.68	Poor Wetness Dusty Depth to bedrock	0.00 0.80 0.92	Poor Wetness Hard to reclaim (rock fragments) Rock fragments	0.00 0.26 0.93
Foglake-----	5	Poor Low content of organic matter Too acid Too clayey	0.00 0.32 0.43	Poor Wetness Low strength Shrink-swell	0.00 0.00 0.76	Poor Wetness Too clayey	0.00 0.31
Spooner, till/bedrock substratum-----	5	Poor Low content of organic matter Too acid Water erosion	0.00 0.50 0.99	Poor Wetness Depth to bedrock Dusty	0.00 0.04 0.80	Poor Wetness Hard to reclaim (rock fragments)	0.00 0.98

# Soil Survey of Voyageurs National Park, Minnesota

Table 15.—Source of Reclamation Material, Roadfill, and Topsoil—Continued

Map unit symbol and soil name	Pct. of map unit	Source of reclamation material		Roadfill source		Topsoil source	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srrn: Bootleg-----	5	Fair Too acid Low content of organic matter Water erosion	 0.32 0.32 0.99	Poor Wetness Low strength Shrink-swell	 0.00 0.00 0.83	Poor Wetness	 0.00
Hassman-----	5	Fair Too acid Low content of organic matter Too clayey	 0.32 0.32 0.45	Poor Wetness Low strength Shrink-swell	 0.00 0.00 0.40	Poor Wetness Too clayey	 0.00 0.50
2srrq: Cathro, ponded-----	60	Poor Low content of organic matter Too acid Water erosion	 0.00 0.84 0.99	Poor Wetness Low strength Dusty	 0.00 0.00 0.80 0.80	Poor Wetness Exchange capacity	 0.00 0.97
Tacoosh, ponded-----	30	Fair Too acid	 0.21	Poor Wetness Low strength Dusty	 0.00 0.00 0.80	Poor Wetness Organic matter content high Too acid	 0.00 0.00 0.85
Sax, ponded-----	5	Poor Wind erosion Low content of organic matter Too acid	 0.00 0.00 0.97	Poor Wetness Low strength Dusty	 0.00 0.22 0.80	Poor Wetness	 0.00
Aquepts, stony, moderately slow Ksat-----	5	Poor Low content of organic matter Too acid Water erosion	 0.00 0.50 0.68	Poor Wetness Dusty	 0.00 0.95	Poor Wetness Hard to reclaim (rock fragments)	 0.00 0.89
2srrr: Insula, very stony, skeletal-----	30	Poor Depth to bedrock Stone content Droughty	 0.00 0.00 0.00	Poor Depth to bedrock Stones Cobble content	 0.00 0.00 0.23	Poor Depth to bedrock Rock fragments Exchange capacity	 0.00 0.01 0.28
Voyageurs-----	20	Poor Low content of organic matter Too acid Water erosion	 0.00 0.50 0.68	Poor Wetness Dusty Depth to bedrock	 0.00 0.80 0.92	Poor Wetness Hard to reclaim (rock fragments) Rock fragments	 0.00 0.26 0.93
Wahlsten, very stony	15	Fair Droughty Too acid Depth to bedrock	 0.01 0.50 0.61	Poor Depth to bedrock Wetness	 0.00 0.53	Fair Rock fragments Wetness Depth to bedrock	 0.32 0.53 0.61



# Soil Survey of Voyageurs National Park, Minnesota

Table 15.—Source of Reclamation Material, Roadfill, and Topsoil—Continued

Map unit symbol and soil name	Pct. of map unit	Source of reclamation material		Roadfill source		Topsoil source	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srrr: Conic, very stony, skeletal-----	10	Poor Droughty Depth to bedrock Too acid	0.00 0.12 0.50	Poor Depth to bedrock Cobble content Stones	0.00 0.03 0.98	Poor Rock fragments Depth to bedrock Exchange capacity	0.00 0.12 0.30
Spooner, till/bedrock substratum-----	8	Poor Low content of organic matter Too acid Water erosion	0.00 0.50 0.99	Poor Wetness Depth to bedrock Dusty	0.00 0.04 0.80	Poor Wetness Hard to reclaim (rock fragments)	0.00 0.98
Brickton-----	5	Fair Too acid Low content of organic matter Too clayey	0.21 0.32 0.61	Poor Wetness Low strength Shrink-swell	0.00 0.00 0.34	Poor Wetness Too clayey	0.00 0.50
Dishno, very stony, skeletal-----	5	Fair Low content of organic matter Too acid Droughty	0.08 0.12 0.53	Fair Depth to bedrock Wetness	0.50 0.53	Poor Rock fragments Wetness Exchange capacity	0.00 0.53 0.68
Aquepts, very rubbly	3	Poor Low content of organic matter Stone content Too acid	0.00 0.00 0.00 0.39	Poor Wetness Stones Cobble content	0.00 0.00 0.87	Poor Wetness Hard to reclaim (rock fragments) Rock fragments	0.00 0.08 0.12
Aquepts, stony, moderately slow Ksat-----	2	Poor Low content of organic matter Too acid Water erosion	0.00 0.50 0.68	Poor Wetness Dusty	0.00 0.95	Poor Wetness Hard to reclaim (rock fragments)	0.00 0.89
Rock outcrop-----	2	Not rated		Not rated		Not rated	
2srtr: Bowstring, frequently flooded	50	Poor Wind erosion Too acid	0.00 0.92	Poor Wetness Low strength Dusty	0.00 0.00 0.80	Poor Wetness Organic matter content high	0.00 0.00
Fluvaquents, frequently flooded	40	Poor Low content of organic matter	0.00	Poor Wetness	0.00	Poor Wetness Hard to reclaim (rock fragments) Rock fragments	0.00 0.05 0.81

# Soil Survey of Voyageurs National Park, Minnesota

Table 15.—Source of Reclamation Material, Roadfill, and Topsoil—Continued

Map unit symbol and soil name	Pct. of map unit	Source of reclamation material		Roadfill source		Topsoil source	
		Rating class and limiting features	Value	Rating class and limiting features	Value	Rating class and limiting features	Value
2srtt: Cathro, frequently flooded-----	10	Poor Low content of organic matter Too acid Water erosion	0.00  0.84 0.99	Poor Wetness Low strength Dusty	0.00 0.00 0.80	Poor Wetness Exchange capacity	0.00 0.97
W: Water-----	100	Not rated		Not rated		Not rated	

Table 16.--Engineering Properties

(Absence of an entry indicates that data were not estimated)

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srmd: Quetico, bouldery-----	0-1	Stony slightly decomposed plant material, moderately decomposed plant material	PT	A-8	0-87	0-25	---	---	---	---	---	---
	1-5	Stony loam, very stony sandy loam, gravelly loam, very cobbly fine sandy loam, fine sandy loam	SM, SC-SM	A-2-4, A-4	0-64	0-25	50-96	48-96	42-91	18-44	24-40	3-9
	5-20	Gravelly sandy loam, stony sandy loam, very cobbly sandy loam, gravelly fine sandy loam, fine sandy loam	SM, SC-SM	A-2-4	0-60	0-24	56-97	55-97	48-92	21-44	19-27	3-9
	20-200	Bedrock	SM, SC-SM ---	---	---	---	---	---	---	---	---	---
Insula, bouldery	0-4	Stony slightly decomposed plant material, moderately decomposed plant material	PT	A-8	0-87	0-25	---	---	---	---	---	---
	4-10	Sandy loam, stony loam, very stony sandy loam, gravelly loam, very cobbly fine sandy loam	SM, GM	A-2-4	0-64	0-25	50-90	48-90	36-74	18-40	24-40	3-9
	10-18	Cobbly sandy loam, stony loam, very stony sandy loam, gravelly loam, very cobbly fine sandy loam	SC, GM, SC-SM	A-2-4	0-61	0-24	55-92	53-91	39-75	19-41	19-28	3-9
	18-29	Cobbly sandy loam, stony loam, very stony sandy loam, gravelly loam, very cobbly fine sandy loam	SC-SM, GM, SC	A-2-4	0-60	0-24	56-92	54-91	40-75	20-41	18-27	3-9
	29-200	Bedrock	---	---	---	---	---	---	---	---	---	---
Rock outcrop.												

Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srmd: Wahlsten, bouldery, skeletal-----	0-5	Moderately decomposed plant material, stony slightly decomposed plant material	PT	A-8	0-87	0-25	---	---	---	---	---	---
	5-8	Highly organic stony loam, very stony sandy loam, gravelly loam, very cobbly fine sandy loam	SM, SC-SM, GM	A-2-4	0-64	4-30	50-91	48-90	39-80	18-41	24-69	3-9
	8-28	Stony loam, very stony sandy loam, gravelly loam, very cobbly fine sandy loam	SC, SC-SM, GM	A-2-4	3-60	3-27	56-94	54-93	43-83	20-43	19-28	3-9
	28-69	Gravelly sandy loam, stony sandy loam, very stony loamy sand, very cobbly fine sandy loam, gravelly fine sandy loam	SM, SC-SM, GP-GM	A-2-4, A-2	0-30	7-30	40-92	37-91	30-80	12-38	0-22	NP-6
	69-94	Very gravelly sandy loam, very gravelly fine sandy loam, gravelly sandy loam, gravelly fine sandy loam, cobbly sandy loam, cobbly fine sandy loam, very stony loamy sand	SM, SC-SM	A-1-b, A-2-4, A-4	0-23	7-29	41-86	38-85	28-69	13-37	0-22	NP-6
	94-200	Bedrock	---	---	---	---	---	---	---	---	---	---

Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srmd: Conic, bouldery, skeletal-----	0-3	Moderately decomposed plant material, stony slightly decomposed plant material	PT	A-8	0-87	0-25	---	---	---	---	---	---
	3-7	Highly organic stony loam, very stony sandy loam, gravelly loam, very cobbly fine sandy loam	GM, SM	A-2-4	0-64	4-30	50-87	48-86	39-76	18-39	24-69	3-9
	7-14	Stony loam, very stony sandy loam, gravelly loam, very cobbly fine sandy loam	SC, SC-SM, GM	A-2-4	3-60	3-27	56-90	54-89	43-79	20-41	19-28	3-9
	14-26	Gravelly sandy loam, stony sandy loam, very stony loamy sand, very cobbly fine sandy loam, gravelly fine sandy loam	SC-SM, GP-GM	A-2-4, A-2	0-30	7-30	40-88	37-88	30-77	12-36	0-22	NP-6
	26-62	Very stony sandy loam, stony fine sandy loam, very stony loamy sand, gravelly fine sandy loam, cobbly sandy loam, very cobbly fine sandy loam	SC-SM, GM	A-1, A-1-b, A-2-4	0-30	7-30	40-88	37-88	30-77	12-36	0-22	NP-6
	62-200	Bedrock	---	---	---	---	---	---	---	---	---	---

Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srmd: Arcadian, very stony-----	0-6	Moderately decomposed plant material, stony peat	PT	A-8	0-87	0-25	---	---	---	---	---	---
	6-7	Fine sandy loam, stony loam, cobbly sandy loam, very cobbly highly organic sandy loam	GM	A-2-5	0-56	0-70	32-92	28-92	21-76	12-49	23-82	4-10
	7-14	Cobbly sandy loam, fine sandy loam, very cobbly sandy loam, stony loam	SM	A-2-4	0-50	0-62	43-95	40-95	30-85	16-51	16-31	1-12
	14-21	Fine sandy loam, very cobbly sandy loam, cobbly sandy loam, gravelly loam	SM	A-2-4	0-49	0-62	44-95	41-95	30-85	15-51	27-44	1-7
	21-41	Gravelly loamy coarse sand, very cobbly fine sandy loam, cobbly sandy loam, fine sandy loam, gravelly sandy loam	SC-SM	A-2-4	0-46	0-46	55-94	52-93	38-84	19-50	0-26	NP-8
	41-200	Bedrock	---	---	---	---	---	---	---	---	---	---
2srqm: Quetico, bouldery-----	0-1	Stony slightly decomposed plant material, moderately decomposed plant material	PT	A-8	0-87	0-25	---	---	---	---	---	---
	1-5	Stony loam, very stony sandy loam, gravelly loam, very cobbly fine sandy loam, fine sandy loam	SM, SC-SM	A-2-4, A-4	0-64	0-25	50-96	48-96	42-91	18-44	24-40	3-9
	5-20	Gravelly sandy loam, stony sandy loam, very cobbly sandy loam, gravelly fine sandy loam, fine sandy loam	SM, SC-SM	A-2-4	0-60	0-24	56-97	55-97	48-92	21-44	19-27	3-9
	20-200	Bedrock	---	---	---	---	---	---	---	---	---	---

Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srqm: Insula, bouldery	0-4	Stony slightly decomposed plant material, moderately decomposed plant material	PT	A-8	0-87	0-25	---	---	---	---	---	---
	4-10	Sandy loam, stony loam, very stony sandy loam, gravelly loam, very cobbly fine sandy loam	SM, GM	A-2-4	0-64	0-25	50-90	48-90	36-74	18-40	24-40	3-9
	10-18	Cobbly sandy loam, stony loam, very stony sandy loam, gravelly loam, very cobbly fine sandy loam	SC, GM, SC-SM	A-2-4	0-61	0-24	55-92	53-91	39-75	19-41	19-28	3-9
	18-29	Cobbly sandy loam, stony loam, very stony sandy loam, gravelly loam, very cobbly fine sandy loam	SC-SM, GM, SC	A-2-4	0-60	0-24	56-92	54-91	40-75	20-41	18-27	3-9
	29-200	Bedrock	---	---	---	---	---	---	---	---	---	---
Rock outcrop.												



Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srqm: Conic, bouldery, skeletal-----	0-3	Moderately decomposed plant material, stony slightly decomposed plant material	PT	A-8	0-87	0-25	---	---	---	---	---	---
	3-7	Highly organic stony loam, very stony sandy loam, gravelly loam, very cobbly fine sandy loam	GM, SM	A-2-4	0-64	4-30	50-87	48-86	39-76	18-39	24-69	3-9
	7-14	Stony loam, very stony sandy loam, gravelly loam, very cobbly fine sandy loam	SC, SC-SM, GM	A-2-4	3-60	3-27	56-90	54-89	43-79	20-41	19-28	3-9
	14-26	Gravelly sandy loam, stony sandy loam, very stony loamy sand, very cobbly fine sandy loam, gravelly fine sandy loam	SC-SM, GP-GM	A-2-4, A-2	0-30	7-30	40-88	37-88	30-77	12-36	0-22	NP-6
	26-62	Very stony sandy loam, stony fine sandy loam, very stony loamy sand, gravelly fine sandy loam, cobbly sandy loam, very cobbly fine sandy loam	SC-SM, GM	A-1, A-1-b, A-2-4	0-30	7-30	40-88	37-88	30-77	12-36	0-22	NP-6
	62-200	Bedrock	---	---	---	---	---	---	---	---	---	---

Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srqm: Arcadian, very stony-----	0-6	Moderately decomposed plant material, stony peat	PT	A-8	0-87	0-25	---	---	---	---	---	---
	6-7	Fine sandy loam, stony loam, cobbly sandy loam, very cobbly highly organic sandy loam	GM	A-2-5	0-56	0-70	32-92	28-92	21-76	12-49	23-82	4-10
	7-14	Cobbly sandy loam, fine sandy loam, very cobbly sandy loam, stony loam	SM	A-2-4	0-50	0-62	43-95	40-95	30-85	16-51	16-31	1-12
	14-21	Fine sandy loam, very cobbly sandy loam, cobbly sandy loam, gravelly loam	SM	A-2-4	0-49	0-62	44-95	41-95	30-85	15-51	27-44	1-7
	21-41	Gravelly loamy coarse sand, very cobbly fine sandy loam, cobbly sandy loam, fine sandy loam, gravelly sandy loam	SC-SM	A-2-4	0-46	0-46	55-94	52-93	38-84	19-50	0-26	NP-8
	41-200	Bedrock	---	---	---	---	---	---	---	---	---	---
2srqn: Insula, very bouldery, skeletal-----	0-10	Very flaggy moderately decomposed plant material	PT	A-8	51-54	39-41	100	100	100	90-100	---	---
	10-18	Stony loam, cobbly sandy loam, highly organic fine sandy loam, very flaggy fine sandy loam	SM, SC-SM	A-2-4	0-51	0-64	41-96	37-96	34-96	15-49	21-82	3-10
	18-40	Very flaggy fine sandy loam, cobbly sandy loam, fine sandy loam, gravelly loam	SC-SM, SM	A-4, A-2-4	0-46	0-62	43-96	40-96	34-96	17-56	0-32	NP-12
	40-200	Bedrock	---	---	---	---	---	---	---	---	---	---

Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srqn: Conic, very bouldery, skeletal-----	0-7	Highly organic very cobbly fine sandy loam, stony loam, cobbly sandy loam, fine sandy loam	GM	A-2-5	0-56	0-70	32-92	28-92	24-86	14-53	23-82	4-10
	7-14	Very cobbly fine sandy loam, stony loam, cobbly sandy loam, fine sandy loam	SM	A-2-4	0-50	0-62	43-95	40-95	35-95	19-58	16-32	1-12
	14-26	Very cobbly fine sandy loam, cobbly sandy loam, gravelly loam	SM	A-2-4	0-49	0-62	44-95	41-95	36-95	18-57	0-30	NP-12
	26-62	Very cobbly fine sandy loam, cobbly sandy loam, gravelly loamy coarse sand	SM	A-2-4	0-49	0-62	44-95	41-95	36-95	18-59	0-30	NP-12
	62-200	Bedrock	---	---	---	---	---	---	---	---	---	---
Rock outcrop.												
Metonga, very stony, skeletal	0-10	Highly organic very cobbly sandy loam, stony loam, cobbly sandy loam, fine sandy loam	GM	A-2-5	0-56	0-70	32-92	28-92	21-76	12-49	23-82	4-10
	10-12	Very cobbly sandy loam, stony loam, cobbly sandy loam, fine sandy loam	SC-SM	A-2-4	0-49	0-62	44-95	41-95	31-85	16-51	0-29	NP-10
	12-41	Very cobbly sandy loam, cobbly sandy loam, gravelly loam	SM	A-2-4	0-49	0-62	44-95	41-95	30-85	15-51	27-44	1-7
	41-61	Gravelly sandy loam, very cobbly fine sandy loam, cobbly sandy loam, gravelly loamy coarse sand	SC-SM	A-2-4	0-46	0-46	55-94	52-93	38-84	19-50	0-26	NP-8
	61-200	Bedrock	---	---	---	---	---	---	---	---	---	---

Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srqn: Quetico, very bouldery, skeletal-----	0-5	Stony loam, flaggy sandy loam, fine sandy loam, highly organic very cobbly fine sandy loam	SM, SC-SM	A-5	0-31	0-47	60-99	58-99	52-99	23-50	21-82	3-10
	5-12	Stony loam, flaggy sandy loam, fine sandy loam, very cobbly sandy loam	SC-SM, SM	A-2-4	0-27	0-42	51-92	48-91	36-83	19-50	0-32	NP-12
	12-200	Bedrock	---	---	---	---	---	---	---	---	---	---
Wahlsten, very stony-----	0-9	Very cobbly highly organic loam, cobbly loam, fine sandy loam, stony loam	GM, OL	A-2-5, A-5	0-56	0-70	32-90	28-90	24-85	16-61	22-82	3-10
	9-22	Loam, cobbly sandy loam, stony sandy loam	SC-SM, SC	A-2-4, A-4	0-50	0-62	43-95	40-94	30-81	15-45	19-32	3-12
	22-78	Fine sandy loam, very flaggy fine sandy loam, gravelly loam, gravelly loamy coarse sand, cobbly sandy loam	SC-SM, SC	A-2-4, A-4	0-49	0-62	44-95	41-94	29-82	13-46	0-30	NP-12
Voyageurs-----	78-200	Bedrock	---	---	---	---	---	---	---	---	---	---
	0-7	Highly organic silt loam, silt loam, loam	OH, CL	A-7-5	0	0	87-100	87-100	79-100	72-95	29-90	9-17
	7-17	Silt loam, loam	CL	A-6	0	0	92-100	91-100	84-100	73-92	26-47	9-19
	17-30	Silty clay loam, silt loam	CL	A-6	0	0	92-100	91-100	82-100	76-100	28-47	12-25
	30-70	Silty clay loam, silt loam, silty clay	CL	A-7-6	0	0	92-100	91-100	77-100	73-100	34-57	16-33
	70-140	Very gravelly loamy sand, fine sandy loam, cobbly sandy loam, very flaggy fine sandy loam, gravelly loam, gravelly loamy coarse sand	SC-SM, SM	A-1-b	0-17	0-29	42-92	38-92	29-81	9-34	0-26	NP-9
	140-200	Bedrock	---	---	---	---	---	---	---	---	---	---

Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srqn: Aquepts, very rubbly-----	0-10	Stony loam, mucky extremely stony sandy loam	SM	A-2-5, A-2, A-4, A-5	16-83	8-68	30-100	26-99	19-80	10-42	30-77	3-6
	10-28	Very stony loam, cobbly loam, stony fine sandy loam, very cobbly loam, extremely stony sandy loam	ML, SC-SM, CL-ML, SM	A-4, A-2	16-87	8-71	45-99	42-99	33-88	22-62	0-29	NP-7
	28-102	Very stony loam, cobbly loam, stony fine sandy loam, very cobbly loam, extremely stony sandy loam	ML, SC-SM, CL-ML, SM	A-4, A-2	1-48	8-54	63-91	61-91	48-81	32-57	0-24	NP-7
	102-200	Cobbly sandy loam, very stony loam, fine sandy loam, stony sandy loam, loam, stony fine sandy loam	SC-SM, SM	A-4, A-2	0-48	3-36	64-96	62-96	45-81	23-46	0-23	NP-7
2srqp: Quetico, very bouldery, skeletal-----	0-5	Stony loam, flaggy sandy loam, fine sandy loam, highly organic very cobbly fine sandy loam	SM, SC-SM	A-5	0-31	0-47	60-99	58-99	52-99	23-50	21-82	3-10
	5-12	Stony loam, flaggy sandy loam, fine sandy loam, very cobbly sandy loam	SC-SM, SM	A-2-4	0-27	0-42	51-92	48-91	36-83	19-50	0-32	NP-12
	12-200	Bedrock	---	---	---	---	---	---	---	---	---	---

Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srqp: Insula, very bouldery, skeletal-----	0-10	Very flaggy moderately decomposed plant material	PT	A-8	51-54	39-41	100	100	100	90-100	---	---
	10-18	Stony loam, cobbly sandy loam, highly organic fine sandy loam, very flaggy fine sandy loam	SM, SC-SM	A-2-4	0-51	0-64	41-96	37-96	34-96	15-49	21-82	3-10
	18-40	Very flaggy fine sandy loam, cobbly sandy loam, fine sandy loam, gravelly loam	SC-SM, SM	A-4, A-2-4	0-46	0-62	43-96	40-96	34-96	17-56	0-32	NP-12
	40-200	Bedrock	---	---	---	---	---	---	---	---	---	---
Greenwood-----	0-20	Peat	PT	A-8	0	0	100	100	100	90-100	---	---
	20-200	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
Rock outcrop.												
Merwin-----	0-25	Peat	PT	A-8	0	0	100	100	100	90-100	---	---
	25-60	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
	60-64	Silty clay loam, loam, mucky silt loam	MH, OH, ML	A-7-5	0	0	100	100	89-100	76-100	38-99	9-26
	64-200	Stratified silt loam to silty clay loam, clay loam, silty clay loam, silt loam, loam	CL	A-6	0	0	100	100	88-100	72-100	25-49	9-29

Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srqp: Aquepts, very rubbly-----	0-10	Stony loam, mucky extremely stony sandy loam	SM	A-2-5, A-2, A-4, A-5	16-83	8-68	30-100	26-99	19-80	10-42	30-77	3-6
	10-28	Very stony loam, cobbly loam, stony fine sandy loam, very cobbly loam, extremely stony sandy loam	ML, SC-SM, CL-ML, SM	A-4, A-2	16-87	8-71	45-99	42-99	33-88	22-62	0-29	NP-7
	28-102	Very stony loam, cobbly loam, stony fine sandy loam, very cobbly loam, extremely stony sandy loam	ML, SC-SM, CL-ML, SM	A-4, A-2	1-48	8-54	63-91	61-91	48-81	32-57	0-24	NP-7
	102-200	Cobbly sandy loam, very stony loam, fine sandy loam, stony sandy loam, loam, stony fine sandy loam	SC-SM, SM	A-4, A-2	0-48	3-36	64-96	62-96	45-81	23-46	0-23	NP-7
Wahlsten, very stony-----			SC-SM, SM	A-4, A-2								
	0-9	Very cobbly highly organic loam, cobbly loam, fine sandy loam, stony loam	GM, OL	A-2-5, A-5	0-56	0-70	32-90	28-90	24-85	16-61	22-82	3-10
	9-22	Loam, cobbly sandy loam, stony sandy loam	SC-SM, SC	A-2-4, A-4	0-50	0-62	43-95	40-94	30-81	15-45	19-32	3-12
	22-78	Fine sandy loam, very flaggy fine sandy loam, gravelly loam, gravelly loamy coarse sand, cobbly sandy loam	SC-SM, SC	A-2-4, A-4	0-49	0-62	44-95	41-94	29-82	13-46	0-30	NP-12
	78-200	Bedrock	---	---	---	---	---	---	---	---	---	---



Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srqp: Conic, very bouldery, skeletal-----	0-7	Highly organic very cobbly fine sandy loam, stony loam, cobbly sandy loam, fine sandy loam	GM	A-2-5	0-56	0-70	32-92	28-92	24-86	14-53	23-82	4-10
	7-14	Very cobbly fine sandy loam, stony loam, cobbly sandy loam, fine sandy loam	SM	A-2-4	0-50	0-62	43-95	40-95	35-95	19-58	16-32	1-12
	14-26	Very cobbly fine sandy loam, cobbly sandy loam, gravelly loam	SM	A-2-4	0-49	0-62	44-95	41-95	36-95	18-57	0-30	NP-12
	26-62	Very cobbly fine sandy loam, cobbly sandy loam, gravelly loamy coarse sand	SM	A-2-4	0-49	0-62	44-95	41-95	36-95	18-59	0-30	NP-12
	62-200	Bedrock	---	---	---	---	---	---	---	---	---	---
2srqr: Greenwood-----	0-20	Peat	PT	A-8	0	0	100	100	100	90-100	---	---
	20-200	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
Merwin-----	0-25	Peat	PT	A-8	0	0	100	100	100	90-100	---	---
	25-60	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
	60-64	Silty clay loam, loam, mucky silt loam	MH, OH, ML	A-7-5	0	0	100	100	89-100	76-100	38-99	9-26
	64-200	Stratified silt loam to silty clay loam, clay loam, silty clay loam, silt loam, loam	CL	A-6	0	0	100	100	88-100	72-100	25-49	9-29
Rifle, moat----	0-125	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
	125-135	Muck	PT	A-8	0	0	100	100	100	90-100	---	---
	135-200	Silty clay loam	CL	A-6	0	0	100	100	93-100	83-100	35-49	18-28
Tacoosh, moat---	0-25	Peat	PT	A-8	0	0	100	100	100	90-100	---	---
	25-125	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
	125-135	Loam, mucky silt loam, silty clay loam	OH, ML	A-5, A-7-5	0	0	77-100	76-100	67-100	50-91	38-99	9-26
	135-200	Clay loam, silty clay loam, silt loam, loam	CL	A-6	0	0	78-100	77-100	57-100	43-81	25-48	9-28

Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srqs: Insula, very stony, skeletal	0-10	Very flaggy moderately decomposed plant material	PT	A-8	51-54	39-41	100	100	100	90-100	---	---
	10-18	Stony loam, cobbly sandy loam, highly organic fine sandy loam, very flaggy fine sandy loam	SM, SC-SM	A-2-4	0-51	0-64	41-96	37-96	34-96	15-49	21-82	3-10
	18-40	Very flaggy fine sandy loam, cobbly sandy loam, fine sandy loam, gravelly loam	SC-SM, SM	A-4, A-2-4	0-46	0-62	43-96	40-96	34-96	17-56	0-32	NP-12
	40-200	Bedrock	---	---	---	---	---	---	---	---	---	---
Conic, very stony, skeletal	0-7	Highly organic very cobbly fine sandy loam, stony loam, cobbly sandy loam, fine sandy loam	GM	A-2-5	0-56	0-70	32-92	28-92	24-86	14-53	23-82	4-10
	7-14	Very cobbly fine sandy loam, stony loam, cobbly sandy loam, fine sandy loam	SM	A-2-4	0-50	0-62	43-95	40-95	35-95	19-58	16-32	1-12
	14-26	Very cobbly fine sandy loam, cobbly sandy loam, gravelly loam	SM	A-2-4	0-49	0-62	44-95	41-95	36-95	18-57	0-30	NP-12
	26-62	Very cobbly fine sandy loam, cobbly sandy loam, gravelly loamy coarse sand	SM	A-2-4	0-49	0-62	44-95	41-95	36-95	18-59	0-30	NP-12
	62-200	Bedrock	---	---	---	---	---	---	---	---	---	---
Wahlsten, very stony-----	0-9	Very cobbly highly organic loam, cobbly loam, fine sandy loam, stony loam	GM, OL	A-2-5, A-5	0-56	0-70	32-90	28-90	24-85	16-61	22-82	3-10
	9-22	Loam, cobbly sandy loam, stony sandy loam	SC-SM, SC	A-2-4, A-4	0-50	0-62	43-95	40-94	30-81	15-45	19-32	3-12
	22-78	Fine sandy loam, very flaggy fine sandy loam, gravelly loam, gravelly loamy coarse sand, cobbly sandy loam	SC-SM, SC	A-2-4, A-4	0-49	0-62	44-95	41-94	29-82	13-46	0-30	NP-12
	78-200	Bedrock	---	---	---	---	---	---	---	---	---	---

Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srqs: Quetico, very stony, skeletal	0-5	Stony loam, flaggy sandy loam, fine sandy loam, highly organic very cobbly fine sandy loam	SM, SC-SM	A-5	0-31	0-47	60-99	58-99	52-99	23-50	21-82	3-10
	5-12	Stony loam, flaggy sandy loam, fine sandy loam, very cobbly sandy loam	SC-SM, SM	A-2-4	0-27	0-42	51-92	48-91	36-83	19-50	0-32	NP-12
	12-200	Bedrock	---	---	---	---	---	---	---	---	---	---
Metonga, very stony, skeletal	0-10	Highly organic very cobbly sandy loam, stony loam, cobbly sandy loam, fine sandy loam	GM	A-2-5	0-56	0-70	32-92	28-92	21-76	12-49	23-82	4-10
	10-12	Very cobbly sandy loam, stony loam, cobbly sandy loam, fine sandy loam	SC-SM	A-2-4	0-49	0-62	44-95	41-95	31-85	16-51	0-29	NP-10
	12-41	Very cobbly sandy loam, cobbly sandy loam, gravelly loam	SM	A-2-4	0-49	0-62	44-95	41-95	30-85	15-51	27-44	1-7
	41-61	Gravelly sandy loam, very cobbly fine sandy loam, cobbly sandy loam, gravelly loamy coarse sand	SC-SM	A-2-4	0-46	0-46	55-94	52-93	38-84	19-50	0-26	NP-8
	61-200	Bedrock	---	---	---	---	---	---	---	---	---	---

Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srqs: Dishno, very stony, skeletal	0-9	Highly organic very cobbly sandy loam, fine sandy loam, stony loam, very flaggy coarse sandy loam	GM, SC-SM	A-2-5	0-58	0-78	32-85	28-84	20-70	12-45	23-82	4-10
	9-18	Very cobbly sandy loam, fine sandy loam, stony loam, very flaggy coarse sandy loam	GC-GM, SC, SC-SM	A-1-b, A-2-4	0-51	0-68	42-90	39-90	30-81	16-48	18-32	3-12
	18-37	Very cobbly sandy loam, fine sandy loam, stony loam, very flaggy coarse sandy loam	SC-SM, SM	A-1-b, A-2-4	0-50	0-63	43-90	40-89	29-75	12-37	19-38	3-11
	37-53	Gravelly sandy loam, cobbly sandy loam, fine sandy loam, very flaggy coarse sandy loam	SC-SM, SM	A-2-4, A-1-b	0-50	0-63	43-85	40-85	29-72	12-37	19-34	3-12
	53-114	Gravelly sandy loam, loamy sand, cobbly sandy loam, fine sandy loam, very flaggy coarse sandy loam	SM, SC-SM	A-1-b, A-2-4	0-50	0-63	43-85	40-85	30-73	13-39	17-29	3-12
	114-125	Gravelly loamy sand, cobbly sandy loam, fine sandy loam, very flaggy coarse sandy loam	SM, SC-SM	A-1-b, A-2-4	0-50	0-62	44-86	40-85	31-77	11-34	0-25	NP-9
	125-200	Bedrock	---	---	---	---	---	---	---	---	---	---

Table 16.—Engineering Properties—Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srqs: Aquepts, very rubbly-----	0-10	Stony loam, mucky extremely stony sandy loam	SM	A-2-5, A-2, A-4, A-5	16-83	8-68	30-100	26-99	19-80	10-42	30-77	3-6
	10-28	Very stony loam, cobbly loam, stony fine sandy loam, very cobbly loam, extremely stony sandy loam	ML, SC-SM, CL-ML, SM	A-4, A-2	16-87	8-71	45-99	42-99	33-88	22-62	0-29	NP-7
	28-102	Very stony loam, cobbly loam, stony fine sandy loam, very cobbly loam, extremely stony sandy loam	ML, SC-SM, CL-ML, SM	A-4, A-2	1-48	8-54	63-91	61-91	48-81	32-57	0-24	NP-7
	102-200	Cobbly sandy loam, very stony loam, fine sandy loam, stony sandy loam, loam, stony fine sandy loam	SC-SM, SM	A-4, A-2	0-48	3-36	64-96	62-96	45-81	23-46	0-23	NP-7
Aquepts, stony, moderately slow Ksat-----	0-18	Mucky loam, fine sandy loam	OH, CL	A-7-5, A-6, A-4	0-2	0-10	71-100	70-100	54-97	37-73	22-89	3-17
	18-38	Loam, silt loam, fine sandy loam, clay loam	CL, CL-ML	A-6, A-4	0	0-7	79-100	78-100	59-99	40-75	19-43	3-21
	38-98	Silty clay loam, silt loam, clay loam, silty clay	CL	A-6	0	0-7	79-100	78-100	71-100	62-100	30-60	13-36
	98-200	Gravelly loam, cobbly sandy loam, stratified fine sandy loam to silt loam to silty clay loam to silty clay, stratified coarse sand to loamy sand, stony loam	GC, CL, SM	A-6, A-4	0-42	0-28	55-100	52-100	40-100	29-90	0-44	NP-25

Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srqs: Voyageurs-----	0-7	Highly organic silt loam, silt loam, loam	OH, CL	A-7-5	0	0	87-100	87-100	79-100	72-95	29-90	9-17
	7-17	Silt loam, loam	CL	A-6	0	0	92-100	91-100	84-100	73-92	26-47	9-19
	17-30	Silty clay loam, silt loam	CL	A-6	0	0	92-100	91-100	82-100	76-100	28-47	12-25
	30-70	Silty clay loam, silt loam, silty clay	CL	A-7-6	0	0	92-100	91-100	77-100	73-100	34-57	16-33
	70-140	Very gravelly loamy sand, fine sandy loam, cobbly sandy loam, very flaggy fine sandy loam, gravelly loam, gravelly loamy coarse sand	SC-SM, SM	A-1-b	0-17	0-29	42-92	38-92	29-81	9-34	0-26	NP-9
	140-200	Bedrock	---	---	---	---	---	---	---	---	---	---
Rock outcrop.												
Foglake-----	0-18	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
	18-20	Mucky silt loam, silty clay loam	CL, OH	A-5, A-7-5	0	0	100	100	81-99	69-91	29-92	9-19
	20-38	Silty clay loam, silt loam	CL	A-7-6	0	0	100	100	93-100	88-100	26-44	9-21
	38-90	Silty clay, silty clay loam	CL, CH	A-7-6	0	0	100	100	95-100	91-100	45-62	25-37
	90-100	Silt loam, silty clay loam	CL	A-7-6	0	0	100	100	94-100	87-100	33-51	15-29
	100-200	Stratified silt loam to silty clay loam, silt loam, silty clay loam	CL	A-6	0	0	100	100	95-100	88-100	30-45	12-25

Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srqs: Eaglesnest, very stony-----	0-6	Highly organic gravelly sandy loam, very cobbly fine sandy loam, stony loam	SC-SM, GM	A-2-4	0-68	5-34	29-72	26-71	19-58	11-36	22-80	3-8
	6-27	Cobbly sandy loam, very gravelly sandy loam, very cobbly fine sandy loam, stony loam	SC-SM, GM, GC-GM, SM	A-2-4	0-60	3-30	39-85	37-84	27-68	16-43	19-29	3-9
	27-79	Cobbly sandy loam, very gravelly sandy loam, very cobbly fine sandy loam, gravelly sandy loam	GC-GM, SM, SC-SM	A-4, A-2, A-1-b	0-60	3-30	39-85	37-84	27-68	13-36	0-22	NP-6
	79-102	Very gravelly coarse sandy loam, very cobbly sandy loam, very cobbly fine sandy loam, gravelly loamy coarse sand, stony sandy loam	GM, SC-SM, SM	A-1-b, A-1, A-1-a	0-30	7-30	40-61	37-60	23-40	10-20	0-20	NP-4
	102-200	Cobbly fine sandy loam, very cobbly coarse sandy loam, very gravelly coarse sandy loam, very cobbly sandy loam, gravelly loamy coarse sand, stony sandy loam	SC-SM, SM, GM	A-1, A-1-b, A-1-a	0-28	6-28	44-72	42-71	26-48	12-24	0-19	NP-4



Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srqv: Voyageurs, oxyaquic-----	0-5	Moderately decomposed plant material	PT	A-8	0	0	100	100	100	90-100	---	---
	5-8	Highly organic silt loam, silt loam	OH, CL	A-7-5	0	0	87-100	87-100	79-100	69-95	26-89	7-17
	8-22	Silt loam, silty clay loam	CL	A-6	0	0	92-100	91-100	85-100	74-96	24-41	7-19
	22-76	Silty clay loam, silt loam	CL	A-7-6	0	0	92-100	91-100	79-100	74-97	28-46	12-25
	76-87	Stratified silty clay loam to fine sandy loam, stratified silt loam to silty clay loam, silt loam	CL	A-6	0	0	92-100	91-100	85-100	79-100	24-40	9-21
	87-101	Very cobbly coarse sand, very gravelly loamy sand, fine sandy loam, very flaggy fine sandy loam, gravelly loam	SP-SC, SM	A-1-b	0-20	0-29	44-93	40-93	18-50	3-16	0-21	NP-6
	101-200	Bedrock	---	---	---	---	---	---	---	---	---	---
Conic, very stony, skeletal	0-7	Highly organic very cobbly fine sandy loam, stony loam, cobbly sandy loam, fine sandy loam	GM	A-2-5	0-56	0-70	32-92	28-92	24-86	14-53	23-82	4-10
	7-14	Very cobbly fine sandy loam, stony loam, cobbly sandy loam, fine sandy loam	SM	A-2-4	0-50	0-62	43-95	40-95	35-95	19-58	16-32	1-12
	14-26	Very cobbly fine sandy loam, cobbly sandy loam, gravelly loam	SM	A-2-4	0-49	0-62	44-95	41-95	36-95	18-57	0-30	NP-12
	26-62	Very cobbly fine sandy loam, cobbly sandy loam, gravelly loamy coarse sand	SM	A-2-4	0-49	0-62	44-95	41-95	36-95	18-59	0-30	NP-12
	62-200	Bedrock	---	---	---	---	---	---	---	---	---	---

Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srqv: Littleswan-----	0-6	Moderately decomposed plant material	PT	A-8	0	0	100	100	100	90-100	---	---
	6-16	Highly organic silt loam, loam, silt loam	ML, CL, OH	A-4	0	0	100	100	92-100	82-100	30-89	9-17
	16-25	Silt loam	CL	A-6	0	0	100	100	95-100	85-100	26-41	9-19
	25-63	Silt loam, silty clay loam	CL	A-6	0	0	100	100	96-100	89-100	28-46	12-25
	63-100	Silty clay loam, silt loam	CL	A-6	0	0	100	100	93-100	86-100	27-45	9-25
	100-200	Silty clay loam, silt loam	CL	A-6, A-7-6	0	0	100	100	93-100	86-100	27-45	9-25
Insula, very stony, skeletal	0-10	Very flaggy moderately decomposed plant material	PT	A-8	51-54	39-41	100	100	100	90-100	---	---
	10-18	Stony loam, cobbly sandy loam, highly organic fine sandy loam, very flaggy fine sandy loam	SM, SC-SM	A-2-4	0-51	0-64	41-96	37-96	34-96	15-49	21-82	3-10
	18-40	Very flaggy fine sandy loam, cobbly sandy loam, fine sandy loam, gravelly loam	SC-SM, SM	A-4, A-2-4	0-46	0-62	43-96	40-96	34-96	17-56	0-32	NP-12
	40-200	Bedrock	---	---	---	---	---	---	---	---	---	---
Wahlsten, very stony-----	0-9	Very cobbly highly organic loam, cobbly loam, fine sandy loam, stony loam	GM, OL	A-2-5, A-5	0-56	0-70	32-90	28-90	24-85	16-61	22-82	3-10
	9-22	Loam, cobbly sandy loam, stony sandy loam	SC-SM, SC	A-2-4, A-4	0-50	0-62	43-95	40-94	30-81	15-45	19-32	3-12
	22-78	Fine sandy loam, very flaggy fine sandy loam, gravelly loam, gravelly loamy coarse sand, cobbly sandy loam	SC-SM, SC	A-2-4, A-4	0-49	0-62	44-95	41-94	29-82	13-46	0-30	NP-12
	78-200	Bedrock	---	---	---	---	---	---	---	---	---	---

Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srqv: Metonga, very stony, skeletal	0-10	Highly organic very cobbly sandy loam, stony loam, cobbly sandy loam, fine sandy loam	GM	A-2-5	0-56	0-70	32-92	28-92	21-76	12-49	23-82	4-10
	10-12	Very cobbly sandy loam, stony loam, cobbly sandy loam, fine sandy loam	SC-SM	A-2-4	0-49	0-62	44-95	41-95	31-85	16-51	0-29	NP-10
	12-41	Very cobbly sandy loam, cobbly sandy loam, gravelly loam	SM	A-2-4	0-49	0-62	44-95	41-95	30-85	15-51	27-44	1-7
	41-61	Gravelly sandy loam, very cobbly fine sandy loam, cobbly sandy loam, gravelly loamy coarse sand	SC-SM	A-2-4	0-46	0-46	55-94	52-93	38-84	19-50	0-26	NP-8
	61-200	Bedrock	---	---	---	---	---	---	---	---	---	---
Baudette-----	0-5	Moderately decomposed plant material	PT	A-8	0	0	100	100	100	90-100	---	---
	5-8	Highly organic silt loam, silt loam	OH, CL	A-7-5	0	0	100	100	96-100	87-99	29-89	9-17
	8-20	Silt loam	CL	A-6	0	0	100	100	96-100	87-98	26-41	9-19
	20-35	Silt loam, silty clay loam	CL	A-6, A-7-6	0	0	100	100	95-100	88-100	28-41	12-21
	35-70	Silty clay loam, silt loam	CL	A-7-6	0	0	100	100	93-100	87-100	29-46	12-25
	70-90	Silt loam, silty clay loam	CL	A-6	0	0	100	100	96-100	89-100	28-41	12-21
	90-200	Silt loam, silty clay loam	CL	A-6	0	0	100	100	96-100	89-100	27-40	9-21

Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srqv: Aquepts, stony, moderately slow Ksat-----	0-18	Mucky loam, fine sandy loam	OH, CL	A-7-5, A-6, A-4	0-2	0-10	71-100	70-100	54-97	37-73	22-89	3-17
	18-38	Loam, silt loam, fine sandy loam, clay loam	CL, CL-ML	A-6, A-4	0	0-7	79-100	78-100	59-99	40-75	19-43	3-21
	38-98	Silty clay loam, silt loam, clay loam, silty clay	CL	A-6	0	0-7	79-100	78-100	71-100	62-100	30-60	13-36
	98-200	Gravelly loam, cobbly sandy loam, stratified fine sandy loam to silt loam to silty clay loam to silty clay, stratified coarse sand to loamy sand, stony loam	GC, CL, SM	A-6, A-4	0-42	0-28	55-100	52-100	40-100	29-90	0-44	NP-25
Rock outcrop.												
2srqw: Wahlsten, very stony-----	0-9	Very cobbly highly organic loam, cobbly loam, fine sandy loam, stony loam	GM, OL	A-2-5, A-5	0-56	0-70	32-90	28-90	24-85	16-61	22-82	3-10
	9-22	Loam, cobbly sandy loam, stony sandy loam	SC-SM, SC	A-2-4, A-4	0-50	0-62	43-95	40-94	30-81	15-45	19-32	3-12
	22-78	Fine sandy loam, very flaggy fine sandy loam, gravelly loam, gravelly loamy coarse sand, cobbly sandy loam	SC-SM, SC	A-2-4, A-4	0-49	0-62	44-95	41-94	29-82	13-46	0-30	NP-12
	78-200	Bedrock	---	---	---	---	---	---	---	---	---	---
Spooner-----	0-15	Mucky silt loam, loam	OH, CL	A-7-5	0	0	100	100	92-100	82-100	29-89	9-17
	15-25	Silt loam	CL	A-6	0	0	100	100	95-100	85-100	27-43	9-18
	25-40	Silty clay loam, silt loam	CL	A-6, A-7-6	0	0	100	100	94-100	87-100	28-41	12-21
	40-70	Silty clay loam, silt loam	CL	A-7-6	0	0	100	100	95-100	87-100	29-46	12-25
	70-100	Silt loam, silty clay loam	CL	A-6	0	0	100	100	96-100	89-100	27-41	9-21
	100-200	Stratified silt loam to silty clay loam, silt loam	CL	A-6	0	0	100	100	95-100	88-100	27-40	9-21

Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srqw: Voyageurs-----	0-7	Highly organic silt loam, silt loam, loam	OH, CL	A-7-5	0	0	87-100	87-100	79-100	72-95	29-90	9-17
	7-17	Silt loam, loam	CL	A-6	0	0	92-100	91-100	84-100	73-92	26-47	9-19
	17-30	Silty clay loam, silt loam	CL	A-6	0	0	92-100	91-100	82-100	76-100	28-47	12-25
	30-70	Silty clay loam, silt loam, silty clay	CL	A-7-6	0	0	92-100	91-100	77-100	73-100	34-57	16-33
	70-140	Very gravelly loamy sand, fine sandy loam, cobbly sandy loam, very flaggy fine sandy loam, gravelly loam, gravelly loamy coarse sand	SC-SM, SM	A-1-b	0-17	0-29	42-92	38-92	29-81	9-34	0-26	NP-9
	140-200	Bedrock	---	---	---	---	---	---	---	---	---	---
Insula, very stony, skeletal	0-10	Very flaggy moderately decomposed plant material	PT	A-8	51-54	39-41	100	100	100	90-100	---	---
	10-18	Stony loam, cobbly sandy loam, highly organic fine sandy loam, very flaggy fine sandy loam	SM, SC-SM	A-2-4	0-51	0-64	41-96	37-96	34-96	15-49	21-82	3-10
	18-40	Very flaggy fine sandy loam, cobbly sandy loam, fine sandy loam, gravelly loam	SC-SM, SM	A-4, A-2-4	0-46	0-62	43-96	40-96	34-96	17-56	0-32	NP-12
	40-200	Bedrock	---	---	---	---	---	---	---	---	---	---

Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srqw: Dishno, very stony, skeletal	0-9	Highly organic very cobbly sandy loam, fine sandy loam, stony loam, very flaggy coarse sandy loam	GM, SC-SM	A-2-5	0-58	0-78	32-85	28-84	20-70	12-45	23-82	4-10
	9-18	Very cobbly sandy loam, fine sandy loam, stony loam, very flaggy coarse sandy loam	GC-GM, SC, SC-SM	A-1-b, A-2-4	0-51	0-68	42-90	39-90	30-81	16-48	18-32	3-12
	18-37	Very cobbly sandy loam, fine sandy loam, stony loam, very flaggy coarse sandy loam	SC-SM, SM	A-1-b, A-2-4	0-50	0-63	43-90	40-89	29-75	12-37	19-38	3-11
	37-53	Gravelly sandy loam, cobbly sandy loam, fine sandy loam, very flaggy coarse sandy loam	SC-SM, SM	A-2-4, A-1-b	0-50	0-63	43-85	40-85	29-72	12-37	19-34	3-12
	53-114	Gravelly sandy loam, loamy sand, cobbly sandy loam, fine sandy loam, very flaggy coarse sandy loam	SM, SC-SM	A-1-b, A-2-4	0-50	0-63	43-85	40-85	30-73	13-39	17-29	3-12
	114-125	Gravelly loamy sand, cobbly sandy loam, fine sandy loam, very flaggy coarse sandy loam	SM, SC-SM	A-1-b, A-2-4	0-50	0-62	44-86	40-85	31-77	11-34	0-25	NP-9
	125-200	Bedrock	---	---	---	---	---	---	---	---	---	---

Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srqw: Aquepts, stony, moderately slow Ksat-----	0-18	Mucky loam, fine sandy loam	OH, CL	A-7-5, A-6, A-4	0-2	0-10	71-100	70-100	54-97	37-73	22-89	3-17
	18-38	Loam, silt loam, fine sandy loam, clay loam	CL, CL-ML	A-6, A-4	0	0-7	79-100	78-100	59-99	40-75	19-43	3-21
	38-98	Silty clay loam, silt loam, clay loam, silty clay	CL	A-6	0	0-7	79-100	78-100	71-100	62-100	30-60	13-36
	98-200	Gravelly loam, cobbly sandy loam, stratified fine sandy loam to silt loam to silty clay loam to silty clay, stratified coarse sand to loamy sand, stony loam	GC, CL, SM	A-6, A-4	0-42	0-28	55-100	52-100	40-100	29-90	0-44	NP-25
Littleswan-----	0-6	Moderately decomposed plant material	PT	A-8	0	0	100	100	100	90-100	---	---
	6-16	Highly organic silt loam, loam, silt loam	ML, CL, OH	A-4	0	0	100	100	92-100	82-100	30-89	9-17
	16-25	Silt loam	CL	A-6	0	0	100	100	95-100	85-100	26-41	9-19
	25-63	Silt loam, silty clay loam	CL	A-6	0	0	100	100	96-100	89-100	28-46	12-25
	63-100	Silty clay loam, silt loam	CL	A-6	0	0	100	100	93-100	86-100	27-45	9-25
	100-200	Silty clay loam, silt loam	CL	A-6, A-7-6	0	0	100	100	93-100	86-100	27-45	9-25



Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srqw: Aquepts, very rubbly-----	0-10	Stony loam, mucky extremely stony sandy loam	SM	A-2-5, A-2, A-4, A-5	16-83	8-68	30-100	26-99	19-80	10-42	30-77	3-6
	10-28	Very stony loam, cobbly loam, stony fine sandy loam, very cobbly loam, extremely stony sandy loam	ML, SC-SM, CL-ML, SM	A-4, A-2	16-87	8-71	45-99	42-99	33-88	22-62	0-29	NP-7
	28-102	Very stony loam, cobbly loam, stony fine sandy loam, very cobbly loam, extremely stony sandy loam	ML, SC-SM, CL-ML, SM	A-4, A-2	1-48	8-54	63-91	61-91	48-81	32-57	0-24	NP-7
	102-200	Cobbly sandy loam, very stony loam, fine sandy loam, stony sandy loam, loam, stony fine sandy loam	SC-SM, SM	A-4, A-2	0-48	3-36	64-96	62-96	45-81	23-46	0-23	NP-7
Rock outcrop.												
2srqy: Baudette-----	0-5	Moderately decomposed plant material	PT	A-8	0	0	100	100	100	90-100	---	---
	5-8	Highly organic silt loam, silt loam	OH, CL	A-7-5	0	0	100	100	96-100	87-99	29-89	9-17
	8-20	Silt loam	CL	A-6	0	0	100	100	96-100	87-98	26-41	9-19
	20-35	Silt loam, silty clay loam	CL	A-6, A-7-6	0	0	100	100	95-100	88-100	28-41	12-21
	35-70	Silty clay loam, silt loam	CL	A-7-6	0	0	100	100	93-100	87-100	29-46	12-25
	70-90	Silt loam, silty clay loam	CL	A-6	0	0	100	100	96-100	89-100	28-41	12-21
	90-200	Silt loam, silty clay loam	CL	A-6	0	0	100	100	96-100	89-100	27-40	9-21

Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srqy: Littleswan-----	0-6	Moderately decomposed plant material	PT	A-8	0	0	100	100	100	90-100	---	---
	6-16	Highly organic silt loam, loam, silt loam	ML, CL, OH	A-4	0	0	100	100	92-100	82-100	30-89	9-17
	16-25	Silt loam	CL	A-6	0	0	100	100	95-100	85-100	26-41	9-19
	25-63	Silt loam, silty clay loam	CL	A-6	0	0	100	100	96-100	89-100	28-46	12-25
	63-100	Silty clay loam, silt loam	CL	A-6	0	0	100	100	93-100	86-100	27-45	9-25
	100-200	Silty clay loam, silt loam	CL	A-6, A-7-6	0	0	100	100	93-100	86-100	27-45	9-25
Voyageurs-----	0-7	Highly organic silt loam, silt loam, loam	OH, CL	A-7-5	0	0	87-100	87-100	79-100	72-95	29-90	9-17
	7-17	Silt loam, loam	CL	A-6	0	0	92-100	91-100	84-100	73-92	26-47	9-19
	17-30	Silty clay loam, silt loam	CL	A-6	0	0	92-100	91-100	82-100	76-100	28-47	12-25
	30-70	Silty clay loam, silt loam, silty clay	CL	A-7-6	0	0	92-100	91-100	77-100	73-100	34-57	16-33
	70-140	Very gravelly loamy sand, fine sandy loam, cobbly sandy loam, very flaggy fine sandy loam, gravelly loam, gravelly loamy coarse sand	SC-SM, SM	A-1-b	0-17	0-29	42-92	38-92	29-81	9-34	0-26	NP-9
	140-200	Bedrock	---	---	---	---	---	---	---	---	---	---
Wahlsten, very stony-----	0-9	Very cobbly highly organic loam, cobbly loam, fine sandy loam, stony loam	GM, OL	A-2-5, A-5	0-56	0-70	32-90	28-90	24-85	16-61	22-82	3-10
	9-22	Loam, cobbly sandy loam, stony sandy loam	SC-SM, SC	A-2-4, A-4	0-50	0-62	43-95	40-94	30-81	15-45	19-32	3-12
	22-78	Fine sandy loam, very flaggy fine sandy loam, gravelly loam, gravelly loamy coarse sand, cobbly sandy loam	SC-SM, SC	A-2-4, A-4	0-49	0-62	44-95	41-94	29-82	13-46	0-30	NP-12
	78-200	Bedrock	---	---	---	---	---	---	---	---	---	---

Table 16.—Engineering Properties—Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srqy: Insula, very stony, skeletal	0-10	Very flaggy moderately decomposed plant material	PT	A-8	51-54	39-41	100	100	100	90-100	---	---
	10-18	Stony loam, cobbly sandy loam, highly organic fine sandy loam, very flaggy fine sandy loam	SM, SC-SM	A-2-4	0-51	0-64	41-96	37-96	34-96	15-49	21-82	3-10
	18-40	Very flaggy fine sandy loam, cobbly sandy loam, fine sandy loam, gravelly loam	SC-SM, SM	A-4, A-2-4	0-46	0-62	43-96	40-96	34-96	17-56	0-32	NP-12
	40-200	Bedrock	---	---	---	---	---	---	---	---	---	---
Spooner-----	0-15	Mucky silt loam, loam	OH, CL	A-7-5	0	0	100	100	92-100	82-100	29-89	9-17
	15-25	Silt loam	CL	A-6	0	0	100	100	95-100	85-100	27-43	9-18
	25-40	Silty clay loam, silt loam	CL	A-6, A-7-6	0	0	100	100	94-100	87-100	28-41	12-21
	40-70	Silty clay loam, silt loam	CL	A-7-6	0	0	100	100	95-100	87-100	29-46	12-25
	70-100	Silt loam, silty clay loam	CL	A-6	0	0	100	100	96-100	89-100	27-41	9-21
	100-200	Stratified silt loam to silty clay loam, silt loam	CL	A-6	0	0	100	100	95-100	88-100	27-40	9-21
2srqz: Canthook-----	0-2	Highly decomposed plant material	PT	A-8	0	0	100	100	100	90-100	---	---
	2-12	Highly organic loam, sandy loam, loam	SM	A-4	0	0	78-100	76-100	57-87	27-49	20-82	2-11
	12-29	Loamy fine sand, fine sandy loam, loamy sand, sandy loam	SM	A-2-4	0	0	78-100	77-100	60-91	21-41	0-30	NP-9
	29-43	Clay loam, stratified silt loam to silty clay loam, silty clay loam, silt loam	CL	A-7-6	0	0	97-100	96-100	74-97	51-73	30-52	13-29
	43-61	Clay loam, silty clay loam, silt loam	CL	A-7-6	0	0	97-100	96-100	79-98	54-72	34-50	16-29
	61-91	Clay loam, silty clay loam, silt loam	CL	A-7-6	0	0	97-100	96-100	79-98	54-72	34-50	16-29
	91-200	Silty clay loam, silt loam, stratified silty clay loam to silty clay to silt loam	CL	A-7-6	0	0	97-100	97-100	80-99	76-95	32-50	14-29

Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srqz: Durkeelake-----	0-8	Highly organic sandy loam, fine sandy loam	SM	A-2-5	0	0	69-100	68-100	49-88	21-46	20-84	2-12
	8-18	Loamy sand, fine sandy loam, sandy loam	SM, SC-SM	A-2-4	0	0	79-100	78-100	61-91	21-40	0-27	NP-9
	18-60	Loamy sand, fine sandy loam, sandy loam	SM, SC-SM	A-2-4	0	0	80-100	79-100	60-89	18-36	0-27	NP-9
	60-85	Silty clay loam, clay loam, stratified silt loam to very fine sandy loam to silty clay loam	CL	A-6	0	0	98-100	98-100	87-100	73-94	30-50	13-29
	85-200	Silty clay loam, silt loam, stratified silty clay loam to silty clay to silt loam	CL	A-6	0	0	98-100	98-100	96-100	85-100	34-59	17-36
Bootleg-----	0-9	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
	9-15	Mucky silt loam, fine sandy loam	OL, CL-ML, SM	A-5	0	0	73-100	72-100	60-99	46-79	20-84	2-12
	15-27	Loamy sand, loamy fine sand, fine sandy loam, sandy loam	SC-SM, SM	A-2-4	0	0	79-100	78-100	58-88	18-36	0-32	NP-9
	27-57	Loamy sand, loamy fine sand, fine sandy loam, sandy loam	SC-SM, SM	A-2-4	0	0	80-100	79-100	59-88	18-36	0-27	NP-9
	57-137	Silty clay loam, silty clay	CH, CL	A-7-6	0	0	97-100	97-100	89-100	83-100	45-66	25-40
	137-200	Silty clay loam, silt loam, stratified silty clay loam to silty clay to silt loam	CL	A-7-6	0	0	97-100	97-100	80-99	75-94	32-50	14-29
Udipsamments----	0-7	Fine sand, loamy sand	SM, SC-SM	A-2-4	0	0	84-100	84-100	77-100	11-23	0-32	NP-6
	7-9	Fine sand, sand	SM	A-2-4	0	0	85-100	84-100	78-100	9-19	0-21	NP-4
	9-40	Fine sand, sand	SM	A-2-4	0	0	86-100	85-100	78-100	10-20	0-20	NP-4
	40-72	Fine sand, sand	SM	A-2-4	0	0	86-100	85-100	78-100	10-20	0-19	NP-4
	72-113	Stratified fine sand to loamy fine sand to fine sandy loam, fine sand, sand	SM	A-2-4	0	0	86-100	85-100	78-99	11-21	0-19	NP-4
	113-200	Fine sand, sand, coarse sand	SP-SM, SM	A-3, A-2-4	0	0	86-100	85-100	79-98	8-14	0-16	NP-2

Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srqz: Grytal-----	0-6	Highly decomposed plant material	PT	A-8	0	0	100	100	100	90-100	---	---
	6-11	Loamy sand, sandy loam, fine sandy loam	SM	A-2-4	0	0	85-100	84-100	63-84	19-32	0-23	NP-6
	11-33	Sand, sandy loam, fine sandy loam, loamy sand	SP-SM, SM	A-2-4	0	0	86-100	85-100	64-85	8-19	0-22	NP-6
	33-104	Sand, loamy sand, coarse sand, fine sand	SP-SM, SM	A-3	0	0	86-100	85-100	64-83	6-15	0-19	NP-4
	104-200	Fine sand, coarse sand	SP-SM, SM	A-2-4	0	0	86-100	85-100	79-98	9-16	0-16	NP-2
Voyageurs-----	0-7	Highly organic silt loam, silt loam, loam	OH, CL	A-7-5	0	0	87-100	87-100	79-100	72-95	29-90	9-17
	7-17	Silt loam, loam	CL	A-6	0	0	92-100	91-100	84-100	73-92	26-47	9-19
	17-30	Silty clay loam, silt loam	CL	A-6	0	0	92-100	91-100	82-100	76-100	28-47	12-25
	30-70	Silty clay loam, silt loam, silty clay	CL	A-7-6	0	0	92-100	91-100	77-100	73-100	34-57	16-33
	70-140	Very gravelly loamy sand, fine sandy loam, cobbly sandy loam, very flaggy fine sandy loam, gravelly loam, gravelly loamy coarse sand	SC-SM, SM	A-1-b	0-17	0-29	42-92	38-92	29-81	9-34	0-26	NP-9
	140-200	Bedrock	---	---	---	---	---	---	---	---	---	---
Aquepts, stony, moderately slow Ksat-----	0-18	Mucky loam, fine sandy loam	OH, CL	A-7-5, A-6, A-4	0-2	0-10	71-100	70-100	54-97	37-73	22-89	3-17
	18-38	Loam, silt loam, fine sandy loam, clay loam	CL, CL-ML	A-6, A-4	0	0-7	79-100	78-100	59-99	40-75	19-43	3-21
	38-98	Silty clay loam, silt loam, clay loam, silty clay	CL	A-6	0	0-7	79-100	78-100	71-100	62-100	30-60	13-36
	98-200	Gravelly loam, cobbly sandy loam, stratified fine sandy loam to silt loam to silty clay loam to silty clay, stratified coarse sand to loamy sand, stony loam	GC, CL, SM	A-6, A-4	0-42	0-28	55-100	52-100	40-100	29-90	0-44	NP-25

Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srr3: Spooner-----	0-15	Mucky silt loam, loam	OH, CL	A-7-5	0	0	100	100	92-100	82-100	29-89	9-17
	15-25	Silt loam	CL	A-6	0	0	100	100	95-100	85-100	27-43	9-18
	25-40	Silty clay loam, silt loam	CL	A-6, A-7-6	0	0	100	100	94-100	87-100	28-41	12-21
	40-70	Silty clay loam, silt loam	CL	A-7-6	0	0	100	100	95-100	87-100	29-46	12-25
	70-100	Silt loam, silty clay loam	CL	A-6	0	0	100	100	96-100	89-100	27-41	9-21
	100-200	Stratified silt loam to silty clay loam, silt loam	CL	A-6	0	0	100	100	95-100	88-100	27-40	9-21
Sax-----	0-21	Muck	PT	A-8	0	0	100	100	100	90-100	---	---
	21-31	Mucky silt loam, silty clay loam	OH, CL	A-7-5	0	0	100	100	92-100	81-100	38-89	9-17
	31-93	Silt loam, silty clay loam	CL	A-6	0	0	100	100	95-100	86-100	27-46	9-25
	93-200	Silt loam, silty clay loam	CL	A-4, A-6	0	0	100	100	94-100	83-100	24-45	7-25
Spooners, till/bedrock substratum-----	0-4	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
	4-14	Mucky fine sandy loam, silt loam, loam	ML, OH	A-7-5	0	0	92-100	91-100	86-100	77-97	29-89	9-17
	14-35	Silt loam, loam	CL	A-6	0	0	92-100	92-100	87-100	80-99	26-46	9-19
	35-70	Silty clay loam, silt loam	CL	A-7-6	0	0	92-100	92-100	84-100	80-100	34-51	16-29
	70-107	Very cobbly loamy coarse sand, stratified very fine sandy loam to very cobbly loamy coarse sand, gravelly loam, cobbly sandy loam, very flaggy fine sandy loam	CL-ML, SM	A-4	0-17	0-29	42-93	39-92	37-92	26-69	0-21	NP-6
	107-200	Bedrock	---	---	---	---	---	---	---	---	---	---

Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srr3: Foglake-----	0-18	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
	18-20	Mucky silt loam, silty clay loam	CL, OH	A-5, A-7-5	0	0	100	100	81-99	69-91	29-92	9-19
	20-38	Silty clay loam, silt loam	CL	A-7-6	0	0	100	100	93-100	88-100	26-44	9-21
	38-90	Silty clay, silty clay loam	CL, CH	A-7-6	0	0	100	100	95-100	91-100	45-62	25-37
	90-100	Silt loam, silty clay loam	CL	A-7-6	0	0	100	100	94-100	87-100	33-51	15-29
	100-200	Stratified silt loam to silty clay loam, silt loam, silty clay loam	CL	A-6	0	0	100	100	95-100	88-100	30-45	12-25
Littleswan-----	0-6	Moderately decomposed plant material	PT	A-8	0	0	100	100	100	90-100	---	---
	6-16	Highly organic silt loam, loam, silt loam	ML, CL, OH	A-4	0	0	100	100	92-100	82-100	30-89	9-17
	16-25	Silt loam	CL	A-6	0	0	100	100	95-100	85-100	26-41	9-19
	25-63	Silt loam, silty clay loam	CL	A-6	0	0	100	100	96-100	89-100	28-46	12-25
	63-100	Silty clay loam, silt loam	CL	A-6	0	0	100	100	93-100	86-100	27-45	9-25
	100-200	Silty clay loam, silt loam	CL	A-6, A-7-6	0	0	100	100	93-100	86-100	27-45	9-25
Bootleg-----	0-9	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
	9-15	Mucky silt loam, fine sandy loam	OL, CL-ML, SM	A-5	0	0	73-100	72-100	60-99	46-79	20-84	2-12
	15-27	Loamy sand, loamy fine sand, fine sandy loam, sandy loam	SC-SM, SM	A-2-4	0	0	79-100	78-100	58-88	18-36	0-32	NP-9
	27-57	Loamy sand, loamy fine sand, fine sandy loam, sandy loam	SC-SM, SM	A-2-4	0	0	80-100	79-100	59-88	18-36	0-27	NP-9
	57-137	Silty clay loam, silty clay	CH, CL	A-7-6	0	0	97-100	97-100	89-100	83-100	45-66	25-40
	137-200	Silty clay loam, silt loam, stratified silty clay loam to silty clay to silt loam	CL	A-7-6	0	0	97-100	97-100	80-99	75-94	32-50	14-29



Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srr3: Canthook-----	0-2	Highly decomposed plant material	PT	A-8	0	0	100	100	100	90-100	---	---
	2-12	Highly organic loam, sandy loam, loam	SM	A-4	0	0	78-100	76-100	57-87	27-49	20-82	2-11
	12-29	Loamy fine sand, fine sandy loam, loamy sand, sandy loam	SM	A-2-4	0	0	78-100	77-100	60-91	21-41	0-30	NP-9
	29-43	Clay loam, stratified silt loam to silty clay loam, silty clay loam, silt loam	CL	A-7-6	0	0	97-100	96-100	74-97	51-73	30-52	13-29
	43-61	Clay loam, silty clay loam, silt loam	CL	A-7-6	0	0	97-100	96-100	79-98	54-72	34-50	16-29
	61-91	Clay loam, silty clay loam, silt loam	CL	A-7-6	0	0	97-100	96-100	79-98	54-72	34-50	16-29
	91-200	Silty clay loam, silt loam, stratified silty clay loam to silty clay to silt loam	CL	A-7-6	0	0	97-100	97-100	80-99	76-95	32-50	14-29
2srr4: Littleswan-----	0-6	Moderately decomposed plant material	PT	A-8	0	0	100	100	100	90-100	---	---
	6-16	Highly organic silt loam, loam, silt loam	ML, CL, OH	A-4	0	0	100	100	92-100	82-100	30-89	9-17
	16-25	Silt loam	CL	A-6	0	0	100	100	95-100	85-100	26-41	9-19
	25-63	Silt loam, silty clay loam	CL	A-6	0	0	100	100	96-100	89-100	28-46	12-25
	63-100	Silty clay loam, silt loam	CL	A-6	0	0	100	100	93-100	86-100	27-45	9-25
	100-200	Silty clay loam, silt loam	CL	A-6, A-7-6 A-6, A-7-6	0	0	100	100	93-100	86-100	27-45	9-25
Spooner-----	0-15	Mucky silt loam, loam	OH, CL	A-7-5	0	0	100	100	92-100	82-100	29-89	9-17
	15-25	Silt loam	CL	A-6	0	0	100	100	95-100	85-100	27-43	9-18
	25-40	Silty clay loam, silt loam	CL	A-6, A-7-6	0	0	100	100	94-100	87-100	28-41	12-21
	40-70	Silty clay loam, silt loam	CL	A-7-6	0	0	100	100	95-100	87-100	29-46	12-25
	70-100	Silt loam, silty clay loam	CL	A-6	0	0	100	100	96-100	89-100	27-41	9-21
	100-200	Stratified silt loam to silty clay loam, silt loam	CL	A-6	0	0	100	100	95-100	88-100	27-40	9-21

Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srr4: Voyageurs-----	0-7	Highly organic silt loam, silt loam, loam	OH, CL	A-7-5	0	0	87-100	87-100	79-100	72-95	29-90	9-17
	7-17	Silt loam, loam	CL	A-6	0	0	92-100	91-100	84-100	73-92	26-47	9-19
	17-30	Silty clay loam, silt loam	CL	A-6	0	0	92-100	91-100	82-100	76-100	28-47	12-25
	30-70	Silty clay loam, silt loam, silty clay	CL	A-7-6	0	0	92-100	91-100	77-100	73-100	34-57	16-33
	70-140	Very gravelly loamy sand, fine sandy loam, cobbly sandy loam, very flaggy fine sandy loam, gravelly loam, gravelly loamy coarse sand	SC-SM, SM	A-1-b	0-17	0-29	42-92	38-92	29-81	9-34	0-26	NP-9
	140-200	Bedrock	---	---	---	---	---	---	---	---	---	---
Spooner, till/bedrock substratum----	0-4	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
	4-14	Mucky fine sandy loam, silt loam, loam	ML, OH	A-7-5	0	0	92-100	91-100	86-100	77-97	29-89	9-17
	14-35	Silt loam, loam	CL	A-6	0	0	92-100	92-100	87-100	80-99	26-46	9-19
	35-70	Silty clay loam, silt loam	CL	A-7-6	0	0	92-100	92-100	84-100	80-100	34-51	16-29
	70-107	Very cobbly loamy coarse sand, stratified very fine sandy loam to very cobbly loamy coarse sand, gravelly loam, cobbly sandy loam, very flaggy fine sandy loam	CL-ML, SM	A-4	0-17	0-29	42-93	39-92	37-92	26-69	0-21	NP-6
	107-200	Bedrock	---	---	---	---	---	---	---	---	---	---
Sax-----	0-21	Muck	PT	A-8	0	0	100	100	100	90-100	---	---
	21-31	Mucky silt loam, silty clay loam	OH, CL	A-7-5	0	0	100	100	92-100	81-100	38-89	9-17
	31-93	Silt loam, silty clay loam	CL	A-6	0	0	100	100	95-100	86-100	27-46	9-25
	93-200	Silt loam, silty clay loam	CL	A-4, A-6	0	0	100	100	94-100	83-100	24-45	7-25

Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srr4: Foglake-----	0-18	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
	18-20	Mucky silt loam, silty clay loam	CL, OH	A-5, A-7-5	0	0	100	100	81-99	69-91	29-92	9-19
	20-38	Silty clay loam, silt loam	CL	A-7-6	0	0	100	100	93-100	88-100	26-44	9-21
	38-90	Silty clay, silty clay loam	CL, CH	A-7-6	0	0	100	100	95-100	91-100	45-62	25-37
	90-100	Silt loam, silty clay loam	CL	A-7-6	0	0	100	100	94-100	87-100	33-51	15-29
	100-200	Stratified silt loam to silty clay loam, silt loam, silty clay loam	CL	A-6	0	0	100	100	95-100	88-100	30-45	12-25
Bootleg-----	0-9	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
	9-15	Mucky silt loam, fine sandy loam	OL, CL-ML, SM	A-5	0	0	73-100	72-100	60-99	46-79	20-84	2-12
	15-27	Loamy sand, loamy fine sand, fine sandy loam, sandy loam	SC-SM, SM	A-2-4	0	0	79-100	78-100	58-88	18-36	0-32	NP-9
	27-57	Loamy sand, loamy fine sand, fine sandy loam, sandy loam	SC-SM, SM	A-2-4	0	0	80-100	79-100	59-88	18-36	0-27	NP-9
	57-137	Silty clay loam, silty clay	CH, CL	A-7-6	0	0	97-100	97-100	89-100	83-100	45-66	25-40
	137-200	Silty clay loam, silt loam, stratified silty clay loam to silty clay to silt loam	CL	A-7-6	0	0	97-100	97-100	80-99	75-94	32-50	14-29

Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srr4: Canthook-----	0-2	Highly decomposed plant material	PT	A-8	0	0	100	100	100	90-100	---	---
	2-12	Highly organic loam, sandy loam, loam	SM	A-4	0	0	78-100	76-100	57-87	27-49	20-82	2-11
	12-29	Loamy fine sand, fine sandy loam, loamy sand, sandy loam	SM	A-2-4	0	0	78-100	77-100	60-91	21-41	0-30	NP-9
	29-43	Clay loam, stratified silt loam to silty clay loam, silty clay loam, silt loam	CL	A-7-6	0	0	97-100	96-100	74-97	51-73	30-52	13-29
	43-61	Clay loam, silty clay loam, silt loam	CL	A-7-6	0	0	97-100	96-100	79-98	54-72	34-50	16-29
	61-91	Clay loam, silty clay loam, silt loam	CL	A-7-6	0	0	97-100	96-100	79-98	54-72	34-50	16-29
	91-200	Silty clay loam, silt loam, stratified silty clay loam to silty clay to silt loam	CL	A-7-6	0	0	97-100	97-100	80-99	76-95	32-50	14-29
2srr7: Mooselake-----	0-60	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
	60-120	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
	120-200	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
Tacoosh, moat---	0-25	Peat	PT	A-8	0	0	100	100	100	90-100	---	---
	25-125	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
	125-135	Loam, mucky silt loam, silty clay loam	OH, ML	A-5, A-7-5	0	0	77-100	76-100	67-100	50-91	38-99	9-26
	135-200	Clay loam, silty clay loam, silt loam, loam	CL	A-6	0	0	78-100	77-100	57-100	43-81	25-48	9-28
Rifle-----	0-30	Peat	PT	A-8	0	0	100	100	100	90-100	---	---
	30-200	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
Cathro, moat----	0-14	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
	14-42	Muck	PT	A-8	0	0	100	100	100	90-100	---	---
	42-48	Loam, clay loam, silty clay loam, mucky silt loam	OH	A-7-5	0	0	71-100	70-100	62-100	51-93	38-95	9-22
	48-62	Silty clay loam, silt loam, loam, clay loam	CL	A-7-6	0	0	78-100	76-100	60-100	49-89	27-61	9-28
	62-200	Silty clay loam, silt loam, loam, clay loam	CL	A-6	0	0	78-100	77-100	61-100	50-89	25-48	9-28

Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srr8:												
Rifle-----	0-25	Peat	PT	A-8	0	0	100	100	100	90-100	---	---
	25-200	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
Tacoosh, moat---	0-25	Peat	PT	A-8	0	0	100	100	100	90-100	---	---
	25-125	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
	125-135	Loam, mucky silt loam, silty clay loam	OH, ML	A-5, A-7-5	0	0	77-100	76-100	67-100	50-91	38-99	9-26
	135-200	Clay loam, silty clay loam, silt loam, loam	CL	A-6	0	0	78-100	77-100	57-100	43-81	25-48	9-28
Greenwood-----	0-20	Peat	PT	A-8	0	0	100	100	100	90-100	---	---
	20-200	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
Aquepts, stony, moderately slow Ksat-----	0-18	Mucky loam, fine sandy loam	OH, CL	A-7-5, A-6, A-4	0-2	0-10	71-100	70-100	54-97	37-73	22-89	3-17
	18-38	Loam, silt loam, fine sandy loam, clay loam	CL, CL-ML	A-6, A-4	0	0-7	79-100	78-100	59-99	40-75	19-43	3-21
	38-98	Silty clay loam, silt loam, clay loam, silty clay	CL	A-6	0	0-7	79-100	78-100	71-100	62-100	30-60	13-36
	98-200	Gravelly loam, cobbly sandy loam, stratified fine sandy loam to silt loam to silty clay loam to silty clay, stratified coarse sand to loamy sand, stony loam	GC, CL, SM	A-6, A-4	0-42	0-28	55-100	52-100	40-100	29-90	0-44	NP-25
2srr9:												
Tacoosh, frequently flooded-----	0-25	Peat	PT	A-8	0	0	100	100	100	90-100	---	---
	25-125	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
	125-135	Loam, mucky silt loam, silty clay loam	OH, ML	A-5, A-7-5	0	0	77-100	76-100	67-100	50-91	38-99	9-26
	135-200	Clay loam, silty clay loam, silt loam, loam	CL	A-6	0	0	78-100	77-100	57-100	43-81	25-48	9-28

Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srr9: Sax, frequently flooded-----	0-21	Muck	PT	A-8	0	0	100	100	100	90-100	---	---
	21-31	Mucky silt loam, silty clay loam	OH, CL	A-7-5	0	0	100	100	92-100	81-100	38-89	9-17
	31-93	Silt loam, silty clay loam	CL	A-6	0	0	100	100	95-100	86-100	27-46	9-25
	93-200	Silt loam, silty clay loam	CL	A-4, A-6	0	0	100	100	94-100	83-100	24-45	7-25
Cathro, frequently flooded-----	0-14	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
	14-42	Muck	PT	A-8	0	0	100	100	100	90-100	---	---
	42-48	Loam, clay loam, silty clay loam, mucky silt loam	OH	A-7-5	0	0	71-100	70-100	62-100	51-93	38-95	9-22
	48-62	Silty clay loam, silt loam, loam, clay loam	CL	A-7-6	0	0	78-100	76-100	60-100	49-89	27-61	9-28
	62-200	Silty clay loam, silt loam, loam, clay loam	CL	A-6	0	0	78-100	77-100	61-100	50-89	25-48	9-28
Rifle, frequently flooded-----	0-125	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
	125-135	Muck	PT	A-8	0	0	100	100	100	90-100	---	---
	135-200	Silty clay loam	CL	A-6	0	0	100	100	93-100	83-100	35-49	18-28
Hassman, frequently flooded-----	0-19	Mucky loam, silty clay loam, mucky silt loam	OH, CL	A-7-5	0	0	100	100	84-100	65-92	42-101	13-26
	19-27	Silty clay loam	CH, CL	A-7-6	0	0	100	100	93-100	87-100	38-54	19-29
	27-46	Silty clay loam, clay, silty clay	CL, CH	A-7-6	0	0	100	100	94-100	90-100	45-72	25-44
	46-74	Silty clay loam, clay, silty clay	CL, CH	A-7-6	0	0	100	100	94-100	90-100	44-72	23-44
	74-152	Stratified silty clay loam to silt loam, clay, silty clay, silty clay loam	CL	A-7-6	0	0	100	100	89-100	82-100	44-61	23-37
	152-200	Stratified silty clay loam to silt loam, clay, silty clay, silty clay loam	CL	A-7-6	0	0	100	100	89-100	82-100	43-60	23-37

Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srrb:												
Aquents, ponded-	0-2	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
	2-6	Silt loam, mucky loam, loam	OH, MH	A-5	0	0-9	76-100	74-100	54-93	36-68	31-89	3-17
	6-25	Loam, silt loam, fine sandy loam	SC-SM, CL	A-5, A-6	0	0-8	78-100	76-100	58-96	40-72	19-45	3-18
	25-200	Gravelly loamy sand, stratified loamy very fine sand to silt loam, loam, silt loam, fine sandy loam	SC-SM, CL	A-4, A-6	0	0-7	55-100	52-100	39-100	30-83	0-38	NP-19
Sax, ponded----	0-21	Muck	PT	A-8	0	0	100	100	100	90-100	---	---
	21-31	Mucky silt loam, silty clay loam	OH, CL	A-7-5	0	0	100	100	92-100	81-100	38-89	9-17
	31-93	Silt loam, silty clay loam	CL	A-6	0	0	100	100	95-100	86-100	27-46	9-25
	93-200	Silt loam, silty clay loam	CL	A-4, A-6	0	0	100	100	94-100	83-100	24-45	7-25
Tacoosh, ponded-	0-25	Peat	PT	A-8	0	0	100	100	100	90-100	---	---
	25-125	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
	125-135	Loam, mucky silt loam, silty clay loam	OH, ML	A-5, A-7-5	0	0	77-100	76-100	67-100	50-91	38-99	9-26
	135-200	Clay loam, silty clay loam, silt loam, loam	CL	A-6	0	0	78-100	77-100	57-100	43-81	25-48	9-28
Rifle, ponded---	0-125	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
	125-135	Muck	PT	A-8	0	0	100	100	100	90-100	---	---
	135-200	Silty clay loam	CL	A-6	0	0	100	100	93-100	83-100	35-49	18-28
Hassman, ponded-	0-19	Mucky loam, silty clay loam, mucky silt loam	OH, CL	A-7-5	0	0	100	100	84-100	65-92	42-101	13-26
	19-27	Silty clay loam	CH, CL	A-7-6	0	0	100	100	93-100	87-100	38-54	19-29
	27-46	Silty clay loam, clay, silty clay	CL, CH	A-7-6	0	0	100	100	94-100	90-100	45-72	25-44
	46-74	Silty clay loam, clay, silty clay	CL, CH	A-7-6	0	0	100	100	94-100	90-100	44-72	23-44
	74-152	Stratified silty clay loam to silt loam, clay, silty clay, silty clay loam	CL	A-7-6	0	0	100	100	89-100	82-100	44-61	23-37
	152-200	Stratified silty clay loam to silt loam, clay, silty clay, silty clay loam	CL	A-7-6	0	0	100	100	89-100	82-100	43-60	23-37



Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srrh: Greenwood, seasonally ponded-----	0-20	Peat	PT	A-8	0	0	100	100	100	90-100	---	---
	20-200	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
Merwin, seasonally ponded-----	0-25	Peat	PT	A-8	0	0	100	100	100	90-100	---	---
	25-60	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
	60-64	Silty clay loam, loam, mucky silt loam	MH, OH, ML	A-7-5	0	0	100	100	89-100	76-100	38-99	9-26
	64-200	Stratified silt loam to silty clay loam, clay loam, silty clay loam, silt loam, loam	CL	A-6	0	0	100	100	88-100	72-100	25-49	9-29
Rifle, seasonally ponded-----	0-30	Peat	PT	A-8	0	0	100	100	100	90-100	---	---
	30-200	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
Tacoosh, seasonally ponded-----	0-25	Peat	PT	A-8	0	0	100	100	100	90-100	---	---
	25-125	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
	125-135	Loam, mucky silt loam, silty clay loam	OH, ML	A-5, A-7-5	0	0	77-100	76-100	67-100	50-91	38-99	9-26
	135-200	Clay loam, silty clay loam, silt loam, loam	CL	A-6	0	0	78-100	77-100	57-100	43-81	25-48	9-28
2srrj: Rifle, seasonally ponded-----	0-5	Peat	PT	A-8	0	0	100	100	100	90-100	---	---
	5-140	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
	140-200	Muck	PT	A-8	0	0	100	100	100	90-100	---	---
Tacoosh, seasonally ponded-----	0-25	Peat	PT	A-8	0	0	100	100	100	90-100	---	---
	25-125	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
	125-135	Loam, mucky silt loam, silty clay loam	OH, ML	A-5, A-7-5	0	0	77-100	76-100	67-100	50-91	38-99	9-26
	135-200	Clay loam, silty clay loam, silt loam, loam	CL	A-6	0	0	78-100	77-100	57-100	43-81	25-48	9-28

Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srrj: Greenwood, seasonally ponded-----	0-20	Peat	PT	A-8	0	0	100	100	100	90-100	---	---
	20-200	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
Aquepts, stony, moderately slow Ksat-----	0-18	Mucky loam, fine sandy loam	OH, CL	A-7-5, A-6, A-4	0-2	0-10	71-100	70-100	54-97	37-73	22-89	3-17
	18-38	Loam, silt loam, fine sandy loam, clay loam	CL, CL-ML	A-6, A-4	0	0-7	79-100	78-100	59-99	40-75	19-43	3-21
	38-98	Silty clay loam, silt loam, clay loam, silty clay	CL	A-6	0	0-7	79-100	78-100	71-100	62-100	30-60	13-36
	98-200	Gravelly loam, cobbly sandy loam, stratified fine sandy loam to silt loam to silty clay loam to silty clay, stratified coarse sand to loamy sand, stony loam	GC, CL, SM	A-6, A-4	0-42	0-28	55-100	52-100	40-100	29-90	0-44	NP-25
2srrk: Insula, very stony, skeletal	0-10	Very flaggy moderately decomposed plant material	PT	A-8	51-54	39-41	100	100	100	90-100	---	---
	10-18	Stony loam, cobbly sandy loam, highly organic fine sandy loam, very flaggy fine sandy loam	SM, SC-SM	A-2-4	0-51	0-64	41-96	37-96	34-96	15-49	21-82	3-10
	18-40	Very flaggy fine sandy loam, cobbly sandy loam, fine sandy loam, gravelly loam	SC-SM, SM	A-4, A-2-4	0-46	0-62	43-96	40-96	34-96	17-56	0-32	NP-12
	40-200	Bedrock	---	---	---	---	---	---	---	---	---	---

Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srrk: Conic, very stony, skeletal	0-7	Highly organic very cobbly fine sandy loam, stony loam, cobbly sandy loam, fine sandy loam	GM	A-2-5	0-56	0-70	32-92	28-92	24-86	14-53	23-82	4-10
	7-14	Very cobbly fine sandy loam, stony loam, cobbly sandy loam, fine sandy loam	SM	A-2-4	0-50	0-62	43-95	40-95	35-95	19-58	16-32	1-12
	14-26	Very cobbly fine sandy loam, cobbly sandy loam, gravelly loam	SM	A-2-4	0-49	0-62	44-95	41-95	36-95	18-57	0-30	NP-12
	26-62	Very cobbly fine sandy loam, cobbly sandy loam, gravelly loamy coarse sand	SM	A-2-4	0-49	0-62	44-95	41-95	36-95	18-59	0-30	NP-12
	62-200	Bedrock	---	---	---	---	---	---	---	---	---	---
Wahlsten, very stony-----	0-9	Very cobbly highly organic loam, cobbly loam, fine sandy loam, stony loam	GM, OL	A-2-5, A-5	0-56	0-70	32-90	28-90	24-85	16-61	22-82	3-10
	9-22	Loam, cobbly sandy loam, stony sandy loam	SC-SM, SC	A-2-4, A-4	0-50	0-62	43-95	40-94	30-81	15-45	19-32	3-12
	22-78	Fine sandy loam, very flaggy fine sandy loam, gravelly loam, gravelly loamy coarse sand, cobbly sandy loam	SC-SM, SC	A-2-4, A-4	0-49	0-62	44-95	41-94	29-82	13-46	0-30	NP-12
	78-200	Bedrock	---	---	---	---	---	---	---	---	---	---
Quetico, very stony, skeletal	0-5	Stony loam, flaggy sandy loam, fine sandy loam, highly organic very cobbly fine sandy loam	SM, SC-SM	A-5	0-31	0-47	60-99	58-99	52-99	23-50	21-82	3-10
	5-12	Stony loam, flaggy sandy loam, fine sandy loam, very cobbly sandy loam	SC-SM, SM	A-2-4	0-27	0-42	51-92	48-91	36-83	19-50	0-32	NP-12
	12-200	Bedrock	---	---	---	---	---	---	---	---	---	---

Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srrk: Metonga, very stony, skeletal	0-10	Highly organic very cobble sandy loam, stony loam, cobble sandy loam, fine sandy loam	GM	A-2-5	0-56	0-70	32-92	28-92	21-76	12-49	23-82	4-10
	10-12	Very cobble sandy loam, stony loam, cobble sandy loam, fine sandy loam	SC-SM	A-2-4	0-49	0-62	44-95	41-95	31-85	16-51	0-29	NP-10
	12-41	Very cobble sandy loam, cobble sandy loam, gravelly loam	SM	A-2-4	0-49	0-62	44-95	41-95	30-85	15-51	27-44	1-7
	41-61	Gravelly sandy loam, very cobble fine sandy loam, cobble sandy loam, gravelly loamy coarse sand	SC-SM	A-2-4	0-46	0-46	55-94	52-93	38-84	19-50	0-26	NP-8
	61-200	Bedrock	---	---	---	---	---	---	---	---	---	---

Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srrk: Dishno, very stony, skeletal	0-9	Highly organic very cobbly sandy loam, fine sandy loam, stony loam, very flaggy coarse sandy loam	GM, SC-SM	A-2-5	0-58	0-78	32-85	28-84	20-70	12-45	23-82	4-10
	9-18	Very cobbly sandy loam, fine sandy loam, stony loam, very flaggy coarse sandy loam	GC-GM, SC, SC-SM	A-1-b, A-2-4	0-51	0-68	42-90	39-90	30-81	16-48	18-32	3-12
	18-37	Very cobbly sandy loam, fine sandy loam, stony loam, very flaggy coarse sandy loam	SC-SM, SM	A-1-b, A-2-4	0-50	0-63	43-90	40-89	29-75	12-37	19-38	3-11
	37-53	Gravelly sandy loam, cobbly sandy loam, fine sandy loam, very flaggy coarse sandy loam	SC-SM, SM	A-2-4, A-1-b	0-50	0-63	43-85	40-85	29-72	12-37	19-34	3-12
	53-114	Gravelly sandy loam, loamy sand, cobbly sandy loam, fine sandy loam, very flaggy coarse sandy loam	SM, SC-SM	A-1-b, A-2-4	0-50	0-63	43-85	40-85	30-73	13-39	17-29	3-12
	114-125	Gravelly loamy sand, cobbly sandy loam, fine sandy loam, very flaggy coarse sandy loam	SM, SC-SM	A-1-b, A-2-4	0-50	0-62	44-86	40-85	31-77	11-34	0-25	NP-9
	125-200	Bedrock	---	---	---	---	---	---	---	---	---	---

Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srrk: Aquepts, very rubbly-----	0-10	Stony loam, mucky extremely stony sandy loam	SM	A-2-5, A-2, A-4, A-5	16-83	8-68	30-100	26-99	19-80	10-42	30-77	3-6
	10-28	Very stony loam, cobbly loam, stony fine sandy loam, very cobbly loam, extremely stony sandy loam	ML, SC-SM, CL-ML, SM	A-4, A-2	16-87	8-71	45-99	42-99	33-88	22-62	0-29	NP-7
	28-102	Very stony loam, cobbly loam, stony fine sandy loam, very cobbly loam, extremely stony sandy loam	ML, SC-SM, CL-ML, SM	A-4, A-2	1-48	8-54	63-91	61-91	48-81	32-57	0-24	NP-7
	102-200	Cobbly sandy loam, very stony loam, fine sandy loam, stony sandy loam, loam, stony fine sandy loam	SC-SM, SM	A-4, A-2	0-48	3-36	64-96	62-96	45-81	23-46	0-23	NP-7
Aquepts, stony, moderately slow Ksat-----	0-18	Mucky loam, fine sandy loam	OH, CL	A-7-5, A-6, A-4	0-2	0-10	71-100	70-100	54-97	37-73	22-89	3-17
	18-38	Loam, silt loam, fine sandy loam, clay loam	CL, CL-ML	A-6, A-4	0	0-7	79-100	78-100	59-99	40-75	19-43	3-21
	38-98	Silty clay loam, silt loam, clay loam, silty clay	CL	A-6	0	0-7	79-100	78-100	71-100	62-100	30-60	13-36
	98-200	Gravelly loam, cobbly sandy loam, stratified fine sandy loam to silt loam to silty clay loam to silty clay, stratified coarse sand to loamy sand, stony loam	GC, CL, SM	A-6, A-4	0-42	0-28	55-100	52-100	40-100	29-90	0-44	NP-25

Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srrk: Voyageurs-----	0-7	Highly organic silt loam, silt loam, loam	OH, CL	A-7-5	0	0	87-100	87-100	79-100	72-95	29-90	9-17
	7-17	Silt loam, loam	CL	A-6	0	0	92-100	91-100	84-100	73-92	26-47	9-19
	17-30	Silty clay loam, silt loam	CL	A-6	0	0	92-100	91-100	82-100	76-100	28-47	12-25
	30-70	Silty clay loam, silt loam, silty clay	CL	A-7-6	0	0	92-100	91-100	77-100	73-100	34-57	16-33
	70-140	Very gravelly loamy sand, fine sandy loam, cobbly sandy loam, very flaggy fine sandy loam, gravelly loam, gravelly loamy coarse sand	SC-SM, SM	A-1-b	0-17	0-29	42-92	38-92	29-81	9-34	0-26	NP-9
	140-200	Bedrock	---	---	---	---	---	---	---	---	---	---
Rock outcrop.												
Foglake-----	0-18	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
	18-20	Mucky silt loam, silty clay loam	CL, OH	A-5, A-7-5	0	0	100	100	81-99	69-91	29-92	9-19
	20-38	Silty clay loam, silt loam	CL	A-7-6	0	0	100	100	93-100	88-100	26-44	9-21
	38-90	Silty clay, silty clay loam	CL, CH	A-7-6	0	0	100	100	95-100	91-100	45-62	25-37
	90-100	Silt loam, silty clay loam	CL	A-7-6	0	0	100	100	94-100	87-100	33-51	15-29
	100-200	Stratified silt loam to silty clay loam, silt loam, silty clay loam	CL	A-6	0	0	100	100	95-100	88-100	30-45	12-25



Table 16.—Engineering Properties—Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srrk: Eaglesnest, very stony-----	0-6	Highly organic gravelly sandy loam, very cobbly fine sandy loam, stony loam	SC-SM, GM	A-2-4	0-68	5-34	29-72	26-71	19-58	11-36	22-80	3-8
	6-27	Cobbly sandy loam, very gravelly sandy loam, very cobbly fine sandy loam, stony loam	SC-SM, GM, GC-GM, SM	A-2-4	0-60	3-30	39-85	37-84	27-68	16-43	19-29	3-9
	27-79	Cobbly sandy loam, very gravelly sandy loam, very cobbly fine sandy loam, gravelly sandy loam	GC-GM, SM, SC-SM	A-4, A-2, A-1-b	0-60	3-30	39-85	37-84	27-68	13-36	0-22	NP-6
	79-102	Very gravelly coarse sandy loam, very cobbly sandy loam, very cobbly fine sandy loam, gravelly loamy coarse sand, stony sandy loam	GM, SC-SM, SM	A-1-b, A-1, A-1-a	0-30	7-30	40-61	37-60	23-40	10-20	0-20	NP-4
	102-200	Cobbly fine sandy loam, very cobbly coarse sandy loam, very gravelly coarse sandy loam, very cobbly sandy loam, gravelly loamy coarse sand, stony sandy loam	SC-SM, SM, GM	A-1, A-1-b, A-1-a	0-28	6-28	44-72	42-71	26-48	12-24	0-19	NP-4
2srrl: Tacoosh, occasionally flooded-----	0-25	Peat	PT	A-8	0	0	100	100	100	90-100	---	---
	25-125	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
	125-135	Loam, mucky silt loam, silty clay loam	OH, ML	A-5, A-7-5	0	0	77-100	76-100	67-100	50-91	38-99	9-26
	135-200	Clay loam, silty clay loam, silt loam, loam	CL	A-6	0	0	78-100	77-100	57-100	43-81	25-48	9-28

Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srrl: Sax, occasionally flooded-----	0-21	Muck	PT	A-8	0	0	100	100	100	90-100	---	---
	21-31	Mucky silt loam, silty clay loam	OH, CL	A-7-5	0	0	100	100	92-100	81-100	38-89	9-17
	31-93	Silt loam, silty clay loam	CL	A-6	0	0	100	100	95-100	86-100	27-46	9-25
	93-200	Silt loam, silty clay loam	CL	A-4, A-6	0	0	100	100	94-100	83-100	24-45	7-25
Cathro, occasionally flooded-----	0-14	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
	14-42	Muck	PT	A-8	0	0	100	100	100	90-100	---	---
	42-48	Loam, clay loam, silty clay loam, mucky silt loam	OH	A-7-5	0	0	71-100	70-100	62-100	51-93	38-95	9-22
	48-62	Silty clay loam, silt loam, loam, clay loam	CL	A-7-6	0	0	78-100	76-100	60-100	49-89	27-61	9-28
	62-200	Silty clay loam, silt loam, loam, clay loam	CL	A-6	0	0	78-100	77-100	61-100	50-89	25-48	9-28
Rifle, occasionally flooded-----	0-125	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
	125-135	Muck	PT	A-8	0	0	100	100	100	90-100	---	---
	135-200	Silty clay loam	CL	A-6	0	0	100	100	93-100	83-100	35-49	18-28
Hassman, occasionally flooded-----	0-19	Mucky loam, silty clay loam, mucky silt loam	OH, CL	A-7-5	0	0	100	100	84-100	65-92	42-101	13-26
	19-27	Silty clay loam	CH, CL	A-7-6	0	0	100	100	93-100	87-100	38-54	19-29
	27-46	Silty clay loam, clay, silty clay	CL, CH	A-7-6	0	0	100	100	94-100	90-100	45-72	25-44
	46-74	Silty clay loam, clay, silty clay	CL, CH	A-7-6	0	0	100	100	94-100	90-100	44-72	23-44
	74-152	Stratified silty clay loam to silt loam, clay, silty clay, silty clay loam	CL	A-7-6	0	0	100	100	89-100	82-100	44-61	23-37
	152-200	Stratified silty clay loam to silt loam, clay, silty clay, silty clay loam	CL	A-7-6	0	0	100	100	89-100	82-100	43-60	23-37

Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srm: Brickton-----	0-13	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
	13-20	Fine sandy loam, mucky silt loam, silt loam	ML, MH	A-7-5, A-4	0	0	95-100	94-100	85-100	74-91	29-79	9-17
	20-38	Silt loam, loam, silty clay loam	CL, CH	A-6	0	0	95-100	95-100	82-100	74-99	26-50	9-25
	38-125	Silty clay loam, silty clay	CL, CH	A-7-6	0	0	98-100	98-100	94-100	89-100	45-72	25-44
	125-155	Silty clay, clay	CH	A-7-6	0	0	98-100	98-100	93-100	89-100	49-72	26-44
	155-200	Silty clay, clay	CH	A-7-6	0	0	98-100	98-100	93-100	89-100	48-70	26-44
Hassman-----	0-19	Mucky loam, silty clay loam, mucky silt loam	OH, CL	A-7-5	0	0	100	100	84-100	65-92	42-101	13-26
	19-27	Silty clay loam	CH, CL	A-7-6	0	0	100	100	93-100	87-100	38-54	19-29
	27-46	Silty clay loam, clay, silty clay	CH, CL	A-7-6	0	0	100	100	94-100	90-100	45-72	25-44
	46-74	Silty clay loam, clay, silty clay	CL, CH	A-7-6	0	0	100	100	94-100	90-100	44-72	23-44
	74-152	Stratified silty clay loam to silt loam, clay, silty clay, silty clay loam	CL	A-7-6	0	0	100	100	89-100	82-100	44-61	23-37
	152-200	Stratified silty clay loam to silt loam, clay, silty clay, silty clay loam	CL	A-7-6	0	0	100	100	89-100	82-100	43-60	23-37
Spoonier, till/bedrock substratum----	0-4	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
	4-14	Mucky fine sandy loam, silt loam, loam	ML, OH	A-7-5	0	0	92-100	91-100	86-100	77-97	29-89	9-17
	14-35	Silt loam, loam	CL	A-6	0	0	92-100	92-100	87-100	80-99	26-46	9-19
	35-70	Silty clay loam, silt loam	CL	A-7-6	0	0	92-100	92-100	84-100	80-100	34-51	16-29
	70-107	Very cobbly loamy coarse sand, stratified very fine sandy loam to very cobbly loamy coarse sand, gravelly loam, cobbly sandy loam, very flaggy fine sandy loam	CL-ML, SM	A-4	0-17	0-29	42-93	39-92	37-92	26-69	0-21	NP-6
	107-200	Bedrock	---	---	---	---	---	---	---	---	---	---

Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srrm: Foglake-----	0-18	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
	18-20	Mucky silt loam, silty clay loam	CL, OH	A-5, A-7-5	0	0	100	100	81-99	69-91	29-92	9-19
	20-38	Silty clay loam, silt loam	CL	A-7-6	0	0	100	100	93-100	88-100	26-44	9-21
	38-90	Silty clay, silty clay loam	CL, CH	A-7-6	0	0	100	100	95-100	91-100	45-62	25-37
	90-100	Silt loam, silty clay loam	CL	A-7-6	0	0	100	100	94-100	87-100	33-51	15-29
	100-200	Stratified silt loam to silty clay loam, silt loam, silty clay loam	CL	A-6	0	0	100	100	95-100	88-100	30-45	12-25
Dalbo-----	0-18	Highly organic silt loam, silt loam	CL, OH, ML	A-4	0	0	98-100	98-100	92-100	87-100	29-89	9-17
	18-38	Silt loam	CL	A-6	0	0	98-100	98-100	92-100	88-100	26-42	9-19
	38-69	Clay, silty clay, silty clay loam	CH	A-7-6	0	0	98-100	98-100	89-100	88-100	46-72	25-45
	69-85	Clay, silty clay loam, silty clay	CH	A-7-6	0	0	98-100	98-100	89-100	88-100	45-71	25-44
	85-118	Silty clay loam, silty clay, clay	CH, CL	A-7-6	0	0	98-100	98-100	90-100	89-100	38-70	19-44
	118-200	Silty clay loam, silty clay, clay	CL, CH	A-7-6	0	0	98-100	98-100	85-100	84-100	38-70	19-44
Bootleg-----	0-9	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
	9-15	Mucky silt loam, fine sandy loam	OL, CL-ML, SM	A-5	0	0	73-100	72-100	60-99	46-79	20-84	2-12
	15-27	Loamy sand, loamy fine sand, fine sandy loam, sandy loam	SC-SM, SM	A-2-4	0	0	79-100	78-100	58-88	18-36	0-32	NP-9
	27-57	Loamy sand, loamy fine sand, fine sandy loam, sandy loam	SC-SM, SM	A-2-4	0	0	80-100	79-100	59-88	18-36	0-27	NP-9
	57-137	Silty clay loam, silty clay	CH, CL	A-7-6	0	0	97-100	97-100	89-100	83-100	45-66	25-40
	137-200	Silty clay loam, silt loam, stratified silty clay loam to silty clay to silt loam	CL	A-7-6	0	0	97-100	97-100	80-99	75-94	32-50	14-29
Tacoosh-----	0-25	Peat	PT	A-8	0	0	100	100	100	90-100	---	---
	25-125	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
	125-135	Loam, mucky silt loam, silty clay loam	OH, ML	A-5, A-7-5	0	0	77-100	76-100	67-100	50-91	38-99	9-26
	135-200	Clay loam, silty clay loam, silt loam, loam	CL	A-6	0	0	78-100	77-100	57-100	43-81	25-48	9-28

Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srrn:												
Brickton-----	0-13	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
	13-20	Fine sandy loam, mucky silt loam, silt loam	ML, MH	A-7-5, A-4	0	0	95-100	94-100	85-100	74-91	29-79	9-17
	20-38	Silt loam, loam, silty clay loam	CL, CH	A-6	0	0	95-100	95-100	82-100	74-99	26-50	9-25
	38-125	Silty clay loam, silty clay	CL, CH	A-7-6	0	0	98-100	98-100	94-100	89-100	45-72	25-44
	125-155	Silty clay, clay	CH	A-7-6	0	0	98-100	98-100	93-100	89-100	49-72	26-44
	155-200	Silty clay, clay	CH	A-7-6	0	0	98-100	98-100	93-100	89-100	48-70	26-44
Dalbo-----	0-18	Highly organic silt loam, silt loam	CL, OH, ML	A-4	0	0	98-100	98-100	92-100	87-100	29-89	9-17
	18-38	Silt loam	CL	A-6	0	0	98-100	98-100	92-100	88-100	26-42	9-19
	38-69	Clay, silty clay, silty clay loam	CH	A-7-6	0	0	98-100	98-100	89-100	88-100	46-72	25-45
	69-85	Clay, silty clay loam, silty clay	CH	A-7-6	0	0	98-100	98-100	89-100	88-100	45-71	25-44
	85-118	Silty clay loam, silty clay, clay	CH, CL	A-7-6	0	0	98-100	98-100	90-100	89-100	38-70	19-44
	118-200	Silty clay loam, silty clay, clay	CL, CH	A-7-6	0	0	98-100	98-100	85-100	84-100	38-70	19-44
			CL, CH									
Voyageurs-----	0-7	Highly organic silt loam, silt loam, loam	OH, CL	A-7-5	0	0	87-100	87-100	79-100	72-95	29-90	9-17
	7-17	Silt loam, loam	CL	A-6	0	0	92-100	91-100	84-100	73-92	26-47	9-19
	17-30	Silty clay loam, silt loam	CL	A-6	0	0	92-100	91-100	82-100	76-100	28-47	12-25
	30-70	Silty clay loam, silt loam, silty clay	CL	A-7-6	0	0	92-100	91-100	77-100	73-100	34-57	16-33
	70-140	Very gravelly loamy sand, fine sandy loam, cobbly sandy loam, very flaggy fine sandy loam, gravelly loam, gravelly loamy coarse sand	SC-SM, SM	A-1-b	0-17	0-29	42-92	38-92	29-81	9-34	0-26	NP-9
	140-200	Bedrock	---	---	---	---	---	---	---	---	---	---

Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srrn: Foglake-----	0-18	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
	18-20	Mucky silt loam, silty clay loam	CL, OH	A-5, A-7-5	0	0	100	100	81-99	69-91	29-92	9-19
	20-38	Silty clay loam, silt loam	CL	A-7-6	0	0	100	100	93-100	88-100	26-44	9-21
	38-90	Silty clay, silty clay loam	CL, CH	A-7-6	0	0	100	100	95-100	91-100	45-62	25-37
	90-100	Silt loam, silty clay loam	CL	A-7-6	0	0	100	100	94-100	87-100	33-51	15-29
	100-200	Stratified silt loam to silty clay loam, silt loam, silty clay loam	CL	A-6	0	0	100	100	95-100	88-100	30-45	12-25
Spooner, till/bedrock substratum----	0-4	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
	4-14	Mucky fine sandy loam, silt loam, loam	ML, OH	A-7-5	0	0	92-100	91-100	86-100	77-97	29-89	9-17
	14-35	Silt loam, loam	CL	A-6	0	0	92-100	92-100	87-100	80-99	26-46	9-19
	35-70	Silty clay loam, silt loam	CL	A-7-6	0	0	92-100	92-100	84-100	80-100	34-51	16-29
	70-107	Very cobbly loamy coarse sand, stratified very fine sandy loam to very cobbly loamy coarse sand, gravelly loam, cobbly sandy loam, very flaggy fine sandy loam	CL-ML, SM	A-4	0-17	0-29	42-93	39-92	37-92	26-69	0-21	NP-6
	107-200	Bedrock	---	---	---	---	---	---	---	---	---	---
Bootleg-----	0-9	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
	9-15	Mucky silt loam, fine sandy loam	OL, CL-ML, SM	A-5	0	0	73-100	72-100	60-99	46-79	20-84	2-12
	15-27	Loamy sand, loamy fine sand, fine sandy loam, sandy loam	SC-SM, SM	A-2-4	0	0	79-100	78-100	58-88	18-36	0-32	NP-9
	27-57	Loamy sand, loamy fine sand, fine sandy loam, sandy loam	SC-SM, SM	A-2-4	0	0	80-100	79-100	59-88	18-36	0-27	NP-9
	57-137	Silty clay loam, silty clay	CH, CL	A-7-6	0	0	97-100	97-100	89-100	83-100	45-66	25-40
	137-200	Silty clay loam, silt loam, stratified silty clay loam to silty clay to silt loam	CL	A-7-6	0	0	97-100	97-100	80-99	75-94	32-50	14-29

Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srrn: Hassman-----	0-19	Mucky loam, silty clay loam, mucky silt loam	OH, CL	A-7-5	0	0	100	100	84-100	65-92	42-101	13-26
	19-27	Silty clay loam	CH, CL	A-7-6	0	0	100	100	93-100	87-100	38-54	19-29
	27-46	Silty clay loam, clay, silty clay	CL, CH	A-7-6	0	0	100	100	94-100	90-100	45-72	25-44
	46-74	Silty clay loam, clay, silty clay	CL, CH	A-7-6	0	0	100	100	94-100	90-100	44-72	23-44
	74-152	Stratified silty clay loam to silt loam, clay, silty clay, silty clay loam	CL	A-7-6	0	0	100	100	89-100	82-100	44-61	23-37
	152-200	Stratified silty clay loam to silt loam, clay, silty clay, silty clay loam	CL	A-7-6	0	0	100	100	89-100	82-100	43-60	23-37
2srrq: Cathro, ponded--	0-14	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
	14-42	Muck	PT	A-8	0	0	100	100	100	90-100	---	---
	42-48	Silty clay loam, mucky silt loam, loam, clay loam	OH	A-7-5	0	0	71-100	70-100	62-100	51-93	38-95	9-22
	48-62	Silty clay loam, silt loam, loam, clay loam	CL	A-7-6	0	0	78-100	76-100	60-100	49-89	27-61	9-28
	62-200	Silty clay loam, silt loam, loam, clay loam	CL	A-6	0	0	78-100	77-100	61-100	50-89	25-48	9-28
Tacoosh, ponded-	0-25	Peat	PT	A-8	0	0	100	100	100	90-100	---	---
	25-125	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
	125-135	Loam, mucky silt loam, silty clay loam	OH, ML	A-5, A-7-5	0	0	77-100	76-100	67-100	50-91	38-99	9-26
	135-200	Clay loam, silty clay loam, silt loam, loam	CL	A-6	0	0	78-100	77-100	57-100	43-81	25-48	9-28
Sax, ponded-----	0-21	Muck	PT	A-8	0	0	100	100	100	90-100	---	---
	21-31	Mucky silt loam, silty clay loam	OH, CL	A-7-5	0	0	100	100	92-100	81-100	38-89	9-17
	31-93	Silt loam, silty clay loam	CL	A-6	0	0	100	100	95-100	86-100	27-46	9-25
	93-200	Silt loam, silty clay loam	CL	A-4, A-6	0	0	100	100	94-100	83-100	24-45	7-25



Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srrq: Aquepts, stony, moderately slow Ksat-----	0-18	Mucky loam, fine sandy loam	OH, CL	A-7-5, A-6, A-4	0-2	0-10	71-100	70-100	54-97	37-73	22-89	3-17
	18-38	Loam, silt loam, fine sandy loam, clay loam	CL, CL-ML	A-6, A-4	0	0-7	79-100	78-100	59-99	40-75	19-43	3-21
	38-98	Silty clay loam, silt loam, clay loam, silty clay	CL	A-6	0	0-7	79-100	78-100	71-100	62-100	30-60	13-36
	98-200	Gravelly loam, cobbly sandy loam, stratified fine sandy loam to silt loam to silty clay loam to silty clay, stratified coarse sand to loamy sand, stony loam	GC, CL, SM	A-6, A-4	0-42	0-28	55-100	52-100	40-100	29-90	0-44	NP-25
2srrr: Insula, very stony, skeletal	0-10	Very flaggy moderately decomposed plant material	PT	A-8	51-54	39-41	100	100	100	90-100	---	---
	10-18	Stony loam, cobbly sandy loam, highly organic fine sandy loam, very flaggy fine sandy loam	SM, SC-SM	A-2-4	0-51	0-64	41-96	37-96	34-96	15-49	21-82	3-10
	18-40	Very flaggy fine sandy loam, cobbly sandy loam, fine sandy loam, gravelly loam	SC-SM, SM	A-4, A-2-4	0-46	0-62	43-96	40-96	34-96	17-56	0-32	NP-12
	40-200	Bedrock	---	---	---	---	---	---	---	---	---	---

Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srrr: Voyageurs-----	0-7	Highly organic silt loam, silt loam, loam	OH, CL	A-7-5	0	0	87-100	87-100	79-100	72-95	29-90	9-17
	7-17	Silt loam, loam	CL	A-6	0	0	92-100	91-100	84-100	73-92	26-47	9-19
	17-30	Silty clay loam, silt loam	CL	A-6	0	0	92-100	91-100	82-100	76-100	28-47	12-25
	30-70	Silty clay loam, silt loam, silty clay	CL	A-7-6	0	0	92-100	91-100	77-100	73-100	34-57	16-33
	70-140	Very gravelly loamy sand, fine sandy loam, cobbly sandy loam, very flaggy fine sandy loam, gravelly loam, gravelly loamy coarse sand	SC-SM, SM	A-1-b	0-17	0-29	42-92	38-92	29-81	9-34	0-26	NP-9
	140-200	Bedrock	---	---	---	---	---	---	---	---	---	---
Wahlsten, very stony-----	0-9	Very cobbly highly organic loam, cobbly loam, fine sandy loam, stony loam	GM, OL	A-2-5, A-5	0-56	0-70	32-90	28-90	24-85	16-61	22-82	3-10
	9-22	Loam, cobbly sandy loam, stony sandy loam	SC-SM, SC	A-2-4, A-4	0-50	0-62	43-95	40-94	30-81	15-45	19-32	3-12
	22-78	Fine sandy loam, very flaggy fine sandy loam, gravelly loam, gravelly loamy coarse sand, cobbly sandy loam	SC-SM, SC	A-2-4, A-4	0-49	0-62	44-95	41-94	29-82	13-46	0-30	NP-12
	78-200	Bedrock	---	---	---	---	---	---	---	---	---	---

Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srrr: Conic, very stony, skeletal	0-7	Highly organic very cobbly fine sandy loam, stony loam, cobbly sandy loam, fine sandy loam	GM	A-2-5	0-56	0-70	32-92	28-92	24-86	14-53	23-82	4-10
	7-14	Very cobbly fine sandy loam, stony loam, cobbly sandy loam, fine sandy loam	SM	A-2-4	0-50	0-62	43-95	40-95	35-95	19-58	16-32	1-12
	14-26	Very cobbly fine sandy loam, cobbly sandy loam, gravelly loam	SM	A-2-4	0-49	0-62	44-95	41-95	36-95	18-57	0-30	NP-12
	26-62	Very cobbly fine sandy loam, cobbly sandy loam, gravelly loamy coarse sand	SM	A-2-4	0-49	0-62	44-95	41-95	36-95	18-59	0-30	NP-12
	62-200	Bedrock	---	---	---	---	---	---	---	---	---	---
Spooner, till/bedrock substratum-----	0-4	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
	4-14	Mucky fine sandy loam, silt loam, loam	ML, OH	A-7-5	0	0	92-100	91-100	86-100	77-97	29-89	9-17
	14-35	Silt loam, loam	CL	A-6	0	0	92-100	92-100	87-100	80-99	26-46	9-19
	35-70	Silty clay loam, silt loam	CL	A-7-6	0	0	92-100	92-100	84-100	80-100	34-51	16-29
	70-107	Very cobbly loamy coarse sand, stratified very fine sandy loam to very cobbly loamy coarse sand, gravelly loam, cobbly sandy loam, very flaggy fine sandy loam	CL-ML, SM	A-4	0-17	0-29	42-93	39-92	37-92	26-69	0-21	NP-6
	107-200	Bedrock	---	---	---	---	---	---	---	---	---	---
Brickton-----	0-13	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
	13-20	Fine sandy loam, mucky silt loam, silt loam	ML, MH	A-7-5, A-4	0	0	95-100	94-100	85-100	74-91	29-79	9-17
	20-38	Silt loam, loam, silty clay loam	CL, CH	A-6	0	0	95-100	95-100	82-100	74-99	26-50	9-25
	38-125	Silty clay loam, silty clay	CL, CH	A-7-6	0	0	98-100	98-100	94-100	89-100	45-72	25-44
	125-155	Silty clay, clay	CH	A-7-6	0	0	98-100	98-100	93-100	89-100	49-72	26-44
	155-200	Silty clay, clay	CH	A-7-6	0	0	98-100	98-100	93-100	89-100	48-70	26-44

Table 16.—Engineering Properties—Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srrr: Dishno, very stony, skeletal	0-9	Highly organic very cobbly sandy loam, fine sandy loam, stony loam, very flaggy coarse sandy loam	GM, SC-SM	A-2-5	0-58	0-78	32-85	28-84	20-70	12-45	23-82	4-10
	9-18	Very cobbly sandy loam, fine sandy loam, stony loam, very flaggy coarse sandy loam	GC-GM, SC, SC-SM	A-1-b, A-2-4	0-51	0-68	42-90	39-90	30-81	16-48	18-32	3-12
	18-37	Very cobbly sandy loam, fine sandy loam, stony loam, very flaggy coarse sandy loam	SC-SM, SM	A-1-b, A-2-4	0-50	0-63	43-90	40-89	29-75	12-37	19-38	3-11
	37-53	Gravelly sandy loam, cobbly sandy loam, fine sandy loam, very flaggy coarse sandy loam	SC-SM, SM	A-2-4, A-1-b	0-50	0-63	43-85	40-85	29-72	12-37	19-34	3-12
	53-114	Gravelly sandy loam, loamy sand, cobbly sandy loam, fine sandy loam, very flaggy coarse sandy loam	SM, SC-SM	A-1-b, A-2-4	0-50	0-63	43-85	40-85	30-73	13-39	17-29	3-12
	114-125	Gravelly loamy sand, cobbly sandy loam, fine sandy loam, very flaggy coarse sandy loam	SM, SC-SM	A-1-b, A-2-4	0-50	0-62	44-86	40-85	31-77	11-34	0-25	NP-9
	125-200	Bedrock	---	---	---	---	---	---	---	---	---	---

Table 16.--Engineering Properties--Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srrr: Aquepts, very rubbly-----	0-10	Stony loam, mucky extremely stony sandy loam	SM	A-2-5, A-2, A-4, A-5	16-83	8-68	30-100	26-99	19-80	10-42	30-77	3-6
	10-28	Very stony loam, cobbly loam, stony fine sandy loam, very cobbly loam, extremely stony sandy loam	ML, SC-SM, CL-ML, SM	A-4, A-2	16-87	8-71	45-99	42-99	33-88	22-62	0-29	NP-7
	28-102	Very stony loam, cobbly loam, stony fine sandy loam, very cobbly loam, extremely stony sandy loam	ML, SC-SM, CL-ML, SM	A-4, A-2	1-48	8-54	63-91	61-91	48-81	32-57	0-24	NP-7
	102-200	Cobbly sandy loam, very stony loam, fine sandy loam, stony sandy loam, loam, stony fine sandy loam	SC-SM, SM	A-4, A-2	0-48	3-36	64-96	62-96	45-81	23-46	0-23	NP-7
Aquepts, stony, moderately slow Ksat-----	0-18	Mucky loam, fine sandy loam	OH, CL	A-7-5, A-6, A-4	0-2	0-10	71-100	70-100	54-97	37-73	22-89	3-17
	18-38	Loam, silt loam, fine sandy loam, clay loam	CL, CL-ML	A-6, A-4	0	0-7	79-100	78-100	59-99	40-75	19-43	3-21
	38-98	Silty clay loam, silt loam, clay loam, silty clay	CL	A-6	0	0-7	79-100	78-100	71-100	62-100	30-60	13-36
	98-200	Gravelly loam, cobbly sandy loam, stratified fine sandy loam to silt loam to silty clay loam to silty clay, stratified coarse sand to loamy sand, stony loam	GC, CL, SM	A-6, A-4	0-42	0-28	55-100	52-100	40-100	29-90	0-44	NP-25
Rock outcrop.												

Table 16.—Engineering Properties—Continued

Map unit symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>250 mm	75-250 mm	4	10	40	200		
	<u>Cm</u>				<u>Pct</u>	<u>Pct</u>					<u>Pct</u>	
2srst: Bowstring, frequently flooded-----	0-155	Muck	PT	A-8	0	0	100	100	100	90-100	---	---
	155-156	Mucky silt loam, loam, fine sandy loam, loamy sand, sand	ML, SM, OL	A-5	0	0	100	100	76-100	44-73	0-54	NP-5
	156-185	Muck, stratified muck to silt loam	PT	A-8	0	0	100	100	100	90-100	---	---
	185-200	Silt loam, loam, fine sandy loam	CL-ML	A-4	0	0	95-100	95-100	81-100	61-79	16-31	2-13
Fluvaquents, frequently flooded-----	0-15	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
	15-25	Mucky loam	CL, OH	A-5	0	0-10	73-100	72-100	57-99	39-74	22-89	3-17
	25-40	Loam, silt loam, fine sandy loam	SC-SM, CL	A-4	0	0-7	79-100	78-100	61-99	42-74	18-38	3-19
	40-64	Mucky loam, gravelly sandy loam, loam, silt loam, fine sandy loam	CL, SC-SM, OH	A-5, A-7-5	0	0-8	76-100	75-100	60-100	43-77	20-68	3-18
	64-200	Stratified silt loam to cobbly loamy coarse sand, gravelly sandy loam, loam, silt loam, fine sandy loam	SM, CL-ML, SC, SC-SM	A-2-4	0	0-28	67-100	65-100	45-95	21-57	0-37	NP-19
Cathro, frequently flooded-----	0-14	Mucky peat	PT	A-8	0	0	100	100	100	90-100	---	---
	14-42	Muck	PT	A-8	0	0	100	100	100	90-100	---	---
	42-48	Loam, clay loam, silty clay loam, mucky silt loam	OH	A-7-5	0	0	71-100	70-100	62-100	51-93	38-95	9-22
	48-62	Silty clay loam, silt loam, loam, clay loam	CL	A-7-6	0	0	78-100	76-100	60-100	49-89	27-61	9-28
	62-200	Silty clay loam, silt loam, loam, clay loam	CL	A-6	0	0	78-100	77-100	61-100	50-89	25-48	9-28
W. Water												

# Soil Survey of Voyageurs National Park, Minnesota

Table 17.—Physical Soil Properties

(Values for sand, silt, and clay are shown either as a range or as a representative value. Absence of an entry indicates that data were not estimated. Soil properties are measured or inferred from direct observations in the field or laboratory)

Map unit symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Permeability (Ksat)	Available water capacity	Shrink- swell potential	Organic matter
	<u>Cm</u>	<u>Pct</u>	<u>Pct</u>	<u>Pct</u>	<u>g/cc</u>	<u>um/sec</u>	<u>Cm/cm</u>	<u>Pct</u>	<u>Pct</u>
2srmd: Quetico, bouldery-----	0-1	---	---	---	0.10-0.30	42.3-141.1	0.10-0.40	---	50-80
	1-5	43-70	15-50	7-15	0.95-1.40	4.2-42.3	0.05-0.18	0.3-1.3	3.0-7.0
	5-20	43-70	15-50	7-15	1.50-1.60	14.1-141.1	0.05-0.16	0.3-1.1	0.5-1.0
	20-200	---	---	---	---	0.0-0.0	---	---	---
Insula, bouldery	0-4	---	---	---	0.10-0.30	42.3-141.1	0.10-0.40	---	50-80
	4-10	42-70	15-50	7-15	0.80-1.40	4.2-42.3	0.03-0.18	0.3-1.3	3.0-7.0
	10-18	42-70	15-50	7-15	1.40-1.60	4.2-42.3	0.03-0.16	0.3-1.1	0.5-1.5
	18-29	42-70	15-50	7-15	1.40-1.60	4.2-42.3	0.03-0.16	0.3-1.0	0.2-1.0
	29-200	---	---	---	---	0.0-0.0	---	---	---
Rock outcrop.									
Wahlsten, bouldery, skeletal-----	0-5	---	---	---	0.10-0.30	42.3-141.1	0.10-0.40	---	50-80
	5-8	42-70	15-50	7-15	0.80-1.40	4.2-42.3	0.03-0.18	0.3-1.5	3.0-20
	8-28	42-70	15-50	7-15	1.40-1.60	4.2-42.3	0.03-0.16	0.3-0.9	0.5-1.5
	28-69	60-80	15-35	2-10	1.50-1.70	14.1-141.1	0.05-0.14	0.3-0.7	0.2-0.8
	69-94	60-80	15-35	2-10	1.55-1.80	1.4-42.3	0.06-0.14	0.1-1.0	0.0-0.5
	94-200	---	---	---	---	0.0-1.0	---	---	---
Conic, bouldery, skeletal-----	0-3	---	---	---	0.10-0.30	42.3-141.1	0.10-0.40	---	50-80
	3-7	42-70	15-50	7-15	0.80-1.40	4.2-42.3	0.03-0.18	0.3-1.5	3.0-20
	7-14	42-70	15-50	7-15	1.40-1.60	4.2-42.3	0.03-0.16	0.3-0.9	0.5-1.5
	14-26	60-80	15-35	2-10	1.50-1.70	14.1-141.1	0.05-0.14	0.3-0.7	0.2-0.8
	26-62	60-80	15-35	2-10	1.50-1.70	14.1-141.1	0.05-0.14	0.1-1.0	0.2-0.8
	62-200	---	---	---	---	0.0-1.0	---	---	---
Arcadian, very stony-----	0-6	---	---	---	0.10-0.30	42.3-141.1	0.10-0.40	---	50-80
	6-7	45-70	12-46	8-18	0.70-1.40	14.1-42.3	0.05-0.20	0.2-1.7	2.0-25
	7-14	45-70	12-48	4-18	1.45-1.55	14.1-42.3	0.05-0.14	0.0-1.7	0.5-1.5
	14-21	45-80	4-50	2-18	1.50-1.60	14.1-42.3	0.05-0.15	0.0-1.6	1.0-5.0
	21-41	45-85	0-50	1-18	1.50-1.60	14.1-42.3	0.07-0.12	0.0-1.3	0.3-0.9
	41-200	---	---	---	---	0.0-1.0	---	---	---
2srqm: Quetico, bouldery-----	0-1	---	---	---	0.10-0.30	42.3-141.1	0.10-0.40	---	50-80
	1-5	43-70	15-50	7-15	0.95-1.40	4.2-42.3	0.05-0.18	0.3-1.3	3.0-7.0
	5-20	43-70	15-50	7-15	1.50-1.60	14.1-141.1	0.05-0.16	0.3-1.1	0.5-1.0
	20-200	---	---	---	---	0.0-0.0	---	---	---
Insula, bouldery	0-4	---	---	---	0.10-0.30	42.3-141.1	0.10-0.40	---	50-80
	4-10	42-70	15-50	7-15	0.80-1.40	4.2-42.3	0.03-0.18	0.3-1.3	3.0-7.0
	10-18	42-70	15-50	7-15	1.40-1.60	4.2-42.3	0.03-0.16	0.3-1.1	0.5-1.5
	18-29	42-70	15-50	7-15	1.40-1.60	4.2-42.3	0.03-0.16	0.3-1.0	0.2-1.0
	29-200	---	---	---	---	0.0-0.0	---	---	---
Rock outcrop.									



# Soil Survey of Voyageurs National Park, Minnesota

Table 17.—Physical Soil Properties—Continued

Map unit symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Permeability (Ksat)	Available water capacity	Shrink- swell potential	Organic matter
	<u>Cm</u>	<u>Pct</u>	<u>Pct</u>	<u>Pct</u>	<u>g/cc</u>	<u>um/sec</u>	<u>Cm/cm</u>	<u>Pct</u>	<u>Pct</u>
2srqm: Conic, bouldery, skeletal-----	0-3	---	---	---	0.10-0.30	42.3-141.1	0.10-0.40	---	50-80
	3-7	42-70	15-50	7-15	0.80-1.40	4.2-42.3	0.03-0.18	0.3-1.5	3.0-20
	7-14	42-70	15-50	7-15	1.40-1.60	4.2-42.3	0.03-0.16	0.3-0.9	0.5-1.5
	14-26	60-80	15-35	2-10	1.50-1.70	14.1-141.1	0.05-0.14	0.3-0.7	0.2-0.8
	26-62	60-80	15-35	2-10	1.50-1.70	14.1-141.1	0.05-0.14	0.1-1.0	0.2-0.8
	62-200	---	---	---	---	0.0-1.0	---	---	---
Arcadian, very stony-----	0-6	---	---	---	0.10-0.30	42.3-141.1	0.10-0.40	---	50-80
	6-7	45-70	12-46	8-18	0.70-1.40	14.1-42.3	0.05-0.20	0.2-1.7	2.0-25
	7-14	45-70	12-48	4-18	1.45-1.55	14.1-42.3	0.05-0.14	0.0-1.7	0.5-1.5
	14-21	45-80	4-50	2-18	1.50-1.60	14.1-42.3	0.05-0.15	0.0-1.6	1.0-5.0
	21-41	45-85	0-50	1-18	1.50-1.60	14.1-42.3	0.07-0.12	0.0-1.3	0.3-0.9
	41-200	---	---	---	---	0.0-1.0	---	---	---
2srqn: Insula, very bouldery, skeletal-----	0-10	---	---	---	0.10-0.30	42.3-141.1	0.10-0.45	---	50-80
	10-18	45-80	2-46	6-18	0.70-1.45	14.1-42.3	0.10-0.20	0.2-1.2	2.0-25
	18-40	45-80	6-50	2-18	1.45-1.60	14.1-42.3	0.06-0.17	0.1-1.1	0.5-2.0
	40-200	---	---	---	---	0.0-1.0	---	---	---
Conic, very bouldery, skeletal-----	0-7	40-70	12-50	8-18	0.70-1.40	14.1-42.3	0.07-0.20	0.2-1.2	2.0-25
	7-14	40-70	12-50	4-18	1.45-1.55	14.1-42.3	0.06-0.17	0.2-1.1	0.5-2.0
	14-26	45-70	12-50	2-18	1.50-1.60	14.1-42.3	0.06-0.15	0.1-1.0	0.3-0.9
	26-62	45-85	6-50	1-18	1.50-1.60	14.1-42.3	0.06-0.15	0.1-1.0	0.3-0.9
	62-200	---	---	---	---	0.0-1.0	---	---	---
Rock outcrop.									
Metonga, very stony, skeletal	0-10	45-70	12-46	8-18	0.70-1.40	14.1-42.3	0.05-0.20	0.2-1.2	2.0-25
	10-12	45-70	12-48	4-18	1.45-1.55	14.1-42.3	0.05-0.14	0.2-1.1	0.5-2.0
	12-41	45-80	4-50	2-18	1.50-1.60	14.1-42.3	0.05-0.15	0.1-1.1	1.0-5.0
	41-61	45-85	0-50	1-18	1.50-1.60	14.1-42.3	0.07-0.12	0.1-1.0	0.3-0.9
	61-200	---	---	---	---	0.0-1.0	---	---	---
Quetico, very bouldery, skeletal-----	0-5	45-80	2-46	6-18	0.70-1.40	14.1-42.3	0.08-0.20	0.2-1.2	2.0-25
	5-12	45-80	4-50	2-18	1.45-1.55	14.1-42.3	0.05-0.17	0.1-1.1	0.5-2.0
	12-200	---	---	---	---	0.0-1.0	---	---	---
Wahlsten, very stony-----	0-9	35-70	20-50	7-18	0.70-1.40	4.2-14.1	0.09-0.20	0.2-1.3	2.0-25
	9-22	35-70	12-47	7-18	1.45-1.55	4.2-42.3	0.06-0.17	0.2-1.2	0.5-2.0
	22-78	45-85	0-50	2-18	1.50-1.60	4.2-42.3	0.06-0.15	0.1-1.0	0.3-0.9
	78-200	---	---	---	---	0.0-1.0	---	---	---
Voyageurs-----	0-7	5-40	42-80	15-27	0.70-1.40	4.2-14.1	0.20-0.24	0.3-3.8	2.0-25
	7-17	5-40	38-80	15-27	1.45-1.55	4.2-14.1	0.20-0.24	0.7-5.6	0.3-4.0
	17-30	0-20	45-80	18-35	1.45-1.55	1.4-14.1	0.18-0.22	1.3-6.8	0.2-0.8
	30-70	0-20	40-74	24-45	1.45-1.55	1.4-14.1	0.18-0.20	2.6-8.5	0.2-0.8
	70-140	45-85	0-40	2-15	1.55-1.65	4.2-141.1	0.04-0.12	0.0-1.3	0.0-0.2
	140-200	---	---	---	---	0.0-1.0	---	---	---

# Soil Survey of Voyageurs National Park, Minnesota

Table 17.--Physical Soil Properties--Continued

Map unit symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Permeability (Ksat)	Available water capacity	Shrink- swell potential	Organic matter
	<u>Cm</u>	<u>Pct</u>	<u>Pct</u>	<u>Pct</u>	<u>g/cc</u>	<u>um/sec</u>	<u>Cm/cm</u>	<u>Pct</u>	<u>Pct</u>
2srqn: Aquepts, very rubbly-----	0-10	40-72	16-48	6-12	0.80-1.50	4.2-14.1	0.04-0.08	0.0-0.7	6.0-25
	10-28	45-72	26-50	2-12	1.40-1.60	4.2-14.1	0.04-0.13	0.0-0.8	0.5-3.0
	28-102	45-72	26-50	2-12	1.45-1.60	4.2-14.1	0.07-0.17	0.0-0.7	0.3-1.0
	102-200	45-72	16-48	2-12	1.50-1.65	1.4-4.2	0.07-0.16	0.0-0.9	0.0-0.2
2srqp: Quetico, very bouldery, skeletal-----	0-5	45-80	2-46	6-18	0.70-1.40	14.1-42.3	0.08-0.20	0.2-1.2	2.0-25
	5-12	45-80	4-50	2-18	1.45-1.55	14.1-42.3	0.05-0.17	0.1-1.1	0.5-2.0
	12-200	---	---	---	---	0.0-1.0	---	---	---
Insula, very bouldery, skeletal-----	0-10	---	---	---	0.10-0.30	42.3-141.1	0.10-0.45	---	50-80
	10-18	45-80	2-46	6-18	0.70-1.45	14.1-42.3	0.10-0.20	0.2-1.2	2.0-25
	18-40	45-80	6-50	2-18	1.45-1.60	14.1-42.3	0.06-0.17	0.1-1.1	0.5-2.0
	40-200	---	---	---	---	0.0-1.0	---	---	---
Greenwood-----	0-20	---	---	---	0.02-0.15	141.1-705.0	0.55-0.65	---	90-100
	20-200	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
Rock outcrop.									
Merwin-----	0-25	---	---	---	0.02-0.15	141.1-705.0	0.55-0.65	---	90-100
	25-60	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
	60-64	5-50	28-80	15-40	0.90-1.45	1.4-14.1	0.18-0.23	0.5-4.2	6.0-25
	64-200	5-50	22-80	15-40	1.45-1.55	1.4-4.2	0.18-0.20	0.8-4.3	0.0-0.2
Aquepts, very rubbly-----	0-10	40-72	16-48	6-12	0.80-1.50	4.2-14.1	0.04-0.08	0.0-0.7	6.0-25
	10-28	45-72	26-50	2-12	1.40-1.60	4.2-14.1	0.04-0.13	0.0-0.8	0.5-3.0
	28-102	45-72	26-50	2-12	1.45-1.60	4.2-14.1	0.07-0.17	0.0-0.7	0.3-1.0
	102-200	45-72	16-48	2-12	1.50-1.65	1.4-4.2	0.07-0.16	0.0-0.9	0.0-0.2
Wahlsten, very stony-----	0-9	35-70	20-50	7-18	0.70-1.40	4.2-14.1	0.09-0.20	0.2-1.3	2.0-25
	9-22	35-70	12-47	7-18	1.45-1.55	4.2-42.3	0.06-0.17	0.2-1.2	0.5-2.0
	22-78	45-85	0-50	2-18	1.50-1.60	4.2-42.3	0.06-0.15	0.1-1.0	0.3-0.9
	78-200	---	---	---	---	0.0-1.0	---	---	---
Conic, very bouldery, skeletal-----	0-7	40-70	12-50	8-18	0.70-1.40	14.1-42.3	0.07-0.20	0.2-1.2	2.0-25
	7-14	40-70	12-50	4-18	1.45-1.55	14.1-42.3	0.06-0.17	0.2-1.1	0.5-2.0
	14-26	45-70	12-50	2-18	1.50-1.60	14.1-42.3	0.06-0.15	0.1-1.0	0.3-0.9
	26-62	45-85	6-50	1-18	1.50-1.60	14.1-42.3	0.06-0.15	0.1-1.0	0.3-0.9
	62-200	---	---	---	---	0.0-1.0	---	---	---
2srqr: Greenwood-----	0-20	---	---	---	0.02-0.15	141.1-705.0	0.55-0.65	---	90-100
	20-200	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
Merwin-----	0-25	---	---	---	0.02-0.15	141.1-705.0	0.55-0.65	---	90-100
	25-60	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
	60-64	5-50	28-80	15-40	0.90-1.45	1.4-14.1	0.18-0.23	0.5-4.2	6.0-25
	64-200	5-50	22-80	15-40	1.45-1.55	1.4-4.2	0.18-0.20	0.8-4.3	0.0-0.2

# Soil Survey of Voyageurs National Park, Minnesota

Table 17.—Physical Soil Properties—Continued

Map unit symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Permeability (Ksat)	Available water capacity	Shrink- swell potential	Organic matter
	<u>Cm</u>	<u>Pct</u>	<u>Pct</u>	<u>Pct</u>	<u>g/cc</u>	<u>um/sec</u>	<u>Cm/cm</u>	<u>Pct</u>	<u>Pct</u>
<b>2srqr:</b>									
Rifle, moat-----	0-125	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
	125-135	---	---	---	0.15-0.35	4.2-42.3	0.35-0.45	---	35-85
	135-200	0-20	40-73	27-40	1.45-1.55	1.4-4.2	0.18-0.20	2.0-4.2	0.0-0.2
Tacoosh, moat---	0-25	---	---	---	0.02-0.15	141.1-705.0	0.55-0.64	---	90-100
	25-125	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
	125-135	5-52	28-80	15-40	0.90-1.45	1.4-14.1	0.17-0.22	0.4-4.2	6.0-25
	135-200	5-45	15-68	15-40	1.40-1.50	1.4-14.1	0.14-0.19	0.5-2.5	0.0-0.2
<b>2srqs:</b>									
Insula, very stony, skeletal	0-10	---	---	---	0.10-0.30	42.3-141.1	0.10-0.45	---	50-80
	10-18	45-80	2-46	6-18	0.70-1.45	14.1-42.3	0.10-0.20	0.2-1.2	2.0-25
	18-40	45-80	6-50	2-18	1.45-1.60	14.1-42.3	0.06-0.17	0.1-1.1	0.5-2.0
	40-200	---	---	---	---	0.0-1.0	---	---	---
Conic, very stony, skeletal	0-7	40-70	12-50	8-18	0.70-1.40	14.1-42.3	0.07-0.20	0.2-1.2	2.0-25
	7-14	40-70	12-50	4-18	1.45-1.55	14.1-42.3	0.06-0.17	0.2-1.1	0.5-2.0
	14-26	45-70	12-50	2-18	1.50-1.60	14.1-42.3	0.06-0.15	0.1-1.0	0.3-0.9
	26-62	45-85	6-50	1-18	1.50-1.60	14.1-42.3	0.06-0.15	0.1-1.0	0.3-0.9
	62-200	---	---	---	---	0.0-1.0	---	---	---
Wahlsten, very stony-----	0-9	35-70	20-50	7-18	0.70-1.40	4.2-14.1	0.09-0.20	0.2-1.3	2.0-25
	9-22	35-70	12-47	7-18	1.45-1.55	4.2-42.3	0.06-0.17	0.2-1.2	0.5-2.0
	22-78	45-85	0-50	2-18	1.50-1.60	4.2-42.3	0.06-0.15	0.1-1.0	0.3-0.9
	78-200	---	---	---	---	0.0-1.0	---	---	---
Quetico, very stony, skeletal	0-5	45-80	2-46	6-18	0.70-1.40	14.1-42.3	0.08-0.20	0.2-1.2	2.0-25
	5-12	45-80	4-50	2-18	1.45-1.55	14.1-42.3	0.05-0.17	0.1-1.1	0.5-2.0
	12-200	---	---	---	---	0.0-1.0	---	---	---
Metonga, very stony, skeletal	0-10	45-70	12-46	8-18	0.70-1.40	14.1-42.3	0.05-0.20	0.2-1.2	2.0-25
	10-12	45-70	12-48	4-18	1.45-1.55	14.1-42.3	0.05-0.14	0.2-1.1	0.5-2.0
	12-41	45-80	4-50	2-18	1.50-1.60	14.1-42.3	0.05-0.15	0.1-1.1	1.0-5.0
	41-61	45-85	0-50	1-18	1.50-1.60	14.1-42.3	0.07-0.12	0.1-1.0	0.3-0.9
	61-200	---	---	---	---	0.0-1.0	---	---	---
Dishno, very stony, skeletal	0-9	45-70	12-46	8-18	0.70-1.40	4.2-42.3	0.07-0.20	0.3-1.1	2.0-25
	9-18	45-70	12-48	6-18	1.45-1.60	4.2-42.3	0.06-0.17	0.2-1.0	0.5-2.0
	18-37	45-80	2-40	6-18	1.50-1.60	4.2-42.3	0.06-0.18	0.2-1.0	1.0-5.0
	37-53	45-80	2-42	6-18	1.50-1.60	4.2-42.3	0.06-0.16	0.2-1.0	1.0-3.0
	53-114	45-90	0-48	6-18	1.50-1.70	4.2-42.3	0.04-0.12	0.2-1.0	0.0-0.5
	114-125	45-90	0-45	2-15	1.55-1.90	0.3-141.1	0.02-0.09	0.1-0.9	0.0-0.2
	125-200	---	---	---	---	0.0-1.0	---	---	---
Aquepts, very rubby-----	0-10	40-72	16-48	6-12	0.80-1.50	4.2-14.1	0.04-0.08	0.0-0.7	6.0-25
	10-28	45-72	26-50	2-12	1.40-1.60	4.2-14.1	0.04-0.13	0.0-0.8	0.5-3.0
	28-102	45-72	26-50	2-12	1.45-1.60	4.2-14.1	0.07-0.17	0.0-0.7	0.3-1.0
	102-200	45-72	16-48	2-12	1.50-1.65	1.4-4.2	0.07-0.16	0.0-0.9	0.0-0.2
Aquepts, stony, moderately slow Ksat-----	0-18	23-65	8-50	7-27	0.80-1.40	4.2-14.1	0.17-0.22	0.1-3.1	2.0-25
	18-38	20-65	5-72	7-30	1.45-1.55	4.2-14.1	0.17-0.19	0.3-2.9	0.5-2.0
	38-98	10-30	29-70	20-50	1.45-1.55	1.4-4.2	0.18-0.20	1.4-6.4	0.2-0.8
	98-200	10-95	0-88	1-35	1.45-1.65	4.2-14.1	0.17-0.19	0.0-3.5	0.0-0.2

# Soil Survey of Voyageurs National Park, Minnesota

Table 17.--Physical Soil Properties--Continued

Map unit symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Permeability (Ksat)	Available water capacity	Shrink- swell potential	Organic matter
	<u>Cm</u>	<u>Pct</u>	<u>Pct</u>	<u>Pct</u>	<u>g/cc</u>	<u>um/sec</u>	<u>Cm/cm</u>	<u>Pct</u>	<u>Pct</u>
2srqs: Voyageurs-----	0-7	5-40	42-80	15-27	0.70-1.40	4.2-14.1	0.20-0.24	0.3-3.8	2.0-25
	7-17	5-40	38-80	15-27	1.45-1.55	4.2-14.1	0.20-0.24	0.7-5.6	0.3-4.0
	17-30	0-20	45-80	18-35	1.45-1.55	1.4-14.1	0.18-0.22	1.3-6.8	0.2-0.8
	30-70	0-20	40-74	24-45	1.45-1.55	1.4-14.1	0.18-0.20	2.6-8.5	0.2-0.8
	70-140	45-85	0-40	2-15	1.55-1.65	4.2-141.1	0.04-0.12	0.0-1.3	0.0-0.2
	140-200	---	---	---	---	0.0-1.0	---	---	---
Rock outcrop.									
Foglake-----	0-18	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
	18-20	0-40	40-80	15-30	0.80-1.40	1.4-14.1	0.18-0.24	0.3-4.4	2.0-25
	20-38	0-20	50-70	15-30	1.40-1.55	1.4-14.1	0.18-0.20	0.9-4.4	0.5-2.0
	38-90	0-15	40-65	35-50	1.40-1.50	0.4-1.4	0.10-0.20	5.8-9.8	0.2-0.8
	90-100	0-15	46-75	25-40	1.45-1.55	1.4-14.1	0.18-0.22	2.3-6.5	0.0-0.4
	100-200	0-15	53-78	22-35	1.45-1.55	1.4-14.1	0.18-0.22	1.8-5.2	0.0-0.2
Eaglesnest, very stony-----	0-6	42-70	15-50	7-15	0.70-1.40	4.2-42.3	0.05-0.20	0.2-1.0	2.0-25
	6-27	42-70	15-50	7-15	1.40-1.60	4.2-42.3	0.05-0.17	0.2-0.9	0.5-2.0
	27-79	60-80	15-35	2-10	1.45-1.60	14.1-42.3	0.04-0.15	0.1-0.6	0.2-0.6
	79-102	67-85	10-30	2-8	1.50-1.70	1.4-14.1	0.03-0.13	0.0-0.4	0.0-0.5
	102-200	67-85	10-30	2-8	1.80-1.90	0.3-1.4	0.02-0.06	0.0-0.3	0.0-0.0
2srqv: Voyageurs, oxyaquic-----	0-5	---	---	---	0.10-0.30	42.3-141.1	0.25-0.45	---	50-80
	5-8	0-20	53-80	12-27	0.70-1.40	4.2-14.1	0.20-0.24	0.3-3.1	2.0-25
	8-22	0-20	53-80	12-27	1.35-1.50	4.2-14.1	0.20-0.24	0.9-3.8	0.5-2.0
	22-76	0-15	50-76	18-35	1.45-1.55	1.4-4.2	0.18-0.20	1.7-5.2	0.2-0.8
	76-87	5-55	31-81	14-30	1.45-1.55	4.2-14.1	0.11-0.19	1.2-4.0	0.0-0.2
	87-101	45-100	0-45	0-10	1.55-1.70	4.2-141.1	0.02-0.12	0.0-0.9	0.0-0.2
	101-200	---	---	---	---	0.0-1.0	---	---	---
Conic, very stony, skeletal	0-7	40-70	12-50	8-18	0.70-1.40	14.1-42.3	0.07-0.20	0.2-1.2	2.0-25
	7-14	40-70	12-50	4-18	1.45-1.55	14.1-42.3	0.06-0.17	0.2-1.1	0.5-2.0
	14-26	45-70	12-50	2-18	1.50-1.60	14.1-42.3	0.06-0.15	0.1-1.0	0.3-0.9
	26-62	45-85	6-50	1-18	1.50-1.60	14.1-42.3	0.06-0.15	0.1-1.0	0.3-0.9
	62-200	---	---	---	---	0.0-1.0	---	---	---
Little Swan-----	0-6	---	---	---	0.10-0.30	42.3-141.1	0.25-0.45	---	50-80
	6-16	5-40	45-80	15-27	0.70-1.40	4.2-14.1	0.22-0.24	1.2-2.7	2.0-25
	16-25	5-20	57-80	15-27	1.40-1.55	4.2-14.1	0.20-0.24	1.2-3.8	0.5-2.0
	25-63	5-15	56-77	18-35	1.45-1.55	4.2-14.1	0.20-0.22	1.3-4.0	0.2-0.8
	63-100	5-15	50-76	18-35	1.45-1.55	1.4-4.2	0.18-0.20	1.4-4.5	0.0-0.2
	100-200	5-15	50-76	18-35	1.45-1.55	1.4-4.2	0.18-0.20	1.4-4.5	0.0-0.2
Insula, very stony, skeletal	0-10	---	---	---	0.10-0.30	42.3-141.1	0.10-0.45	---	50-80
	10-18	45-80	2-46	6-18	0.70-1.45	14.1-42.3	0.10-0.20	0.2-1.2	2.0-25
	18-40	45-80	6-50	2-18	1.45-1.60	14.1-42.3	0.06-0.17	0.1-1.1	0.5-2.0
	40-200	---	---	---	---	0.0-1.0	---	---	---
Wahlsten, very stony-----	0-9	35-70	20-50	7-18	0.70-1.40	4.2-14.1	0.09-0.20	0.2-1.3	2.0-25
	9-22	35-70	12-47	7-18	1.45-1.55	4.2-42.3	0.06-0.17	0.2-1.2	0.5-2.0
	22-78	45-85	0-50	2-18	1.50-1.60	4.2-42.3	0.06-0.15	0.1-1.0	0.3-0.9
	78-200	---	---	---	---	0.0-1.0	---	---	---

# Soil Survey of Voyageurs National Park, Minnesota

Table 17.--Physical Soil Properties--Continued

Map unit symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Permeability (Ksat)	Available water capacity	Shrink- swell potential	Organic matter
	<u>Cm</u>	<u>Pct</u>	<u>Pct</u>	<u>Pct</u>	<u>g/cc</u>	<u>um/sec</u>	<u>Cm/cm</u>	<u>Pct</u>	<u>Pct</u>
2srqv: Metonga, very stony, skeletal	0-10	45-70	12-46	8-18	0.70-1.40	14.1-42.3	0.05-0.20	0.2-1.2	2.0-25
	10-12	45-70	12-48	4-18	1.45-1.55	14.1-42.3	0.05-0.14	0.2-1.1	0.5-2.0
	12-41	45-80	4-50	2-18	1.50-1.60	14.1-42.3	0.05-0.15	0.1-1.1	1.0-5.0
	41-61	45-85	0-50	1-18	1.50-1.60	14.1-42.3	0.07-0.12	0.1-1.0	0.3-0.9
	61-200	---	---	---	---	0.0-1.0	---	---	---
Baudette-----	0-5	---	---	---	0.10-0.30	42.3-141.1	0.25-0.45	---	50-80
	5-8	10-20	58-75	15-27	0.70-1.40	4.2-14.1	0.22-0.24	0.5-3.1	2.0-25
	8-20	10-20	59-75	15-27	1.35-1.50	4.2-14.1	0.20-0.24	1.2-3.8	0.5-2.0
	20-35	5-15	56-77	18-30	1.45-1.55	4.2-14.1	0.18-0.22	1.3-3.0	0.2-0.8
	35-70	5-15	50-77	18-35	1.45-1.55	1.4-14.1	0.18-0.22	1.8-5.2	0.2-0.8
	70-90	5-15	59-77	18-30	1.45-1.55	4.2-14.1	0.18-0.22	1.7-4.1	0.0-0.5
	90-200	5-15	59-77	18-30	1.45-1.55	4.2-14.1	0.18-0.22	1.4-3.5	0.0-0.1
Aquepts, stony, moderately slow Ksat-----	0-18	23-65	8-50	7-27	0.80-1.40	4.2-14.1	0.17-0.22	0.1-3.1	2.0-25
	18-38	20-65	5-72	7-30	1.45-1.55	4.2-14.1	0.17-0.19	0.3-2.9	0.5-2.0
	38-98	10-30	29-70	20-50	1.45-1.55	1.4-4.2	0.18-0.20	1.4-6.4	0.2-0.8
	98-200	10-95	0-88	1-35	1.45-1.65	4.2-14.1	0.17-0.19	0.0-3.5	0.0-0.2
Rock outcrop.									
2srqw: Wahlsten, very stony-----	0-9	35-70	20-50	7-18	0.70-1.40	4.2-14.1	0.09-0.20	0.2-1.3	2.0-25
	9-22	35-70	12-47	7-18	1.45-1.55	4.2-42.3	0.06-0.17	0.2-1.2	0.5-2.0
	22-78	45-85	0-50	2-18	1.50-1.60	4.2-42.3	0.06-0.15	0.1-1.0	0.3-0.9
	78-200	---	---	---	---	0.0-1.0	---	---	---
Spooner-----	0-15	5-40	45-80	15-27	0.80-1.40	4.2-14.1	0.22-0.24	0.5-3.1	2.0-25
	15-25	5-20	57-80	15-27	1.40-1.50	4.2-14.1	0.20-0.24	1.1-2.6	1.0-3.0
	25-40	5-20	52-77	18-30	1.45-1.55	1.4-14.1	0.18-0.23	1.1-3.9	0.2-0.8
	40-70	5-15	50-75	18-35	1.45-1.55	1.4-14.1	0.18-0.22	1.8-5.2	0.2-0.8
	70-100	5-15	59-77	18-30	1.45-1.55	1.4-14.1	0.18-0.22	1.4-3.7	0.0-0.8
	100-200	5-15	56-77	18-30	1.45-1.55	1.4-14.1	0.18-0.22	1.4-3.6	0.0-0.2
Voyageurs-----	0-7	5-40	42-80	15-27	0.70-1.40	4.2-14.1	0.20-0.24	0.3-3.8	2.0-25
	7-17	5-40	38-80	15-27	1.45-1.55	4.2-14.1	0.20-0.24	0.7-5.6	0.3-4.0
	17-30	0-20	45-80	18-35	1.45-1.55	1.4-14.1	0.18-0.22	1.3-6.8	0.2-0.8
	30-70	0-20	40-74	24-45	1.45-1.55	1.4-14.1	0.18-0.20	2.6-8.5	0.2-0.8
	70-140	45-85	0-40	2-15	1.55-1.65	4.2-141.1	0.04-0.12	0.0-1.3	0.0-0.2
	140-200	---	---	---	---	0.0-1.0	---	---	---
Insula, very stony, skeletal	0-10	---	---	---	0.10-0.30	42.3-141.1	0.10-0.45	---	50-80
	10-18	45-80	2-46	6-18	0.70-1.45	14.1-42.3	0.10-0.20	0.2-1.2	2.0-25
	18-40	45-80	6-50	2-18	1.45-1.60	14.1-42.3	0.06-0.17	0.1-1.1	0.5-2.0
	40-200	---	---	---	---	0.0-1.0	---	---	---
Dishno, very stony-----	0-9	45-70	12-46	8-18	0.70-1.40	4.2-42.3	0.07-0.20	0.3-1.1	2.0-25
	9-18	45-70	12-48	6-18	1.45-1.60	4.2-42.3	0.06-0.17	0.2-1.0	0.5-2.0
	18-37	45-80	2-40	6-18	1.50-1.60	4.2-42.3	0.06-0.18	0.2-1.0	1.0-5.0
	37-53	45-80	2-42	6-18	1.50-1.60	4.2-42.3	0.06-0.16	0.2-1.0	1.0-3.0
	53-114	45-90	0-48	6-18	1.50-1.70	4.2-42.3	0.04-0.12	0.2-1.0	0.0-0.5
	114-125	45-90	0-45	2-15	1.55-1.90	0.3-141.1	0.02-0.09	0.1-0.9	0.0-0.2
	125-200	---	---	---	---	0.0-1.0	---	---	---

# Soil Survey of Voyageurs National Park, Minnesota

Table 17.--Physical Soil Properties--Continued

Map unit symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Permeability (Ksat)	Available water capacity	Shrink- swell potential	Organic matter
	<u>Cm</u>	<u>Pct</u>	<u>Pct</u>	<u>Pct</u>	<u>g/cc</u>	<u>um/sec</u>	<u>Cm/cm</u>	<u>Pct</u>	<u>Pct</u>
2srqw: Aquepts, stony, moderately slow Ksat-----	0-18	23-65	8-50	7-27	0.80-1.40	4.2-14.1	0.17-0.22	0.1-3.1	2.0-25
	18-38	20-65	5-72	7-30	1.45-1.55	4.2-14.1	0.17-0.19	0.3-2.9	0.5-2.0
	38-98	10-30	29-70	20-50	1.45-1.55	1.4-4.2	0.18-0.20	1.4-6.4	0.2-0.8
	98-200	10-95	0-88	1-35	1.45-1.65	4.2-14.1	0.17-0.19	0.0-3.5	0.0-0.2
Little Swan-----	0-6	---	---	---	0.10-0.30	42.3-141.1	0.25-0.45	---	50-80
	6-16	5-40	45-80	15-27	0.70-1.40	4.2-14.1	0.22-0.24	1.2-2.7	2.0-25
	16-25	5-20	57-80	15-27	1.40-1.55	4.2-14.1	0.20-0.24	1.2-3.8	0.5-2.0
	25-63	5-15	56-77	18-35	1.45-1.55	4.2-14.1	0.20-0.22	1.3-4.0	0.2-0.8
	63-100	5-15	50-76	18-35	1.45-1.55	1.4-4.2	0.18-0.20	1.4-4.5	0.0-0.2
	100-200	5-15	50-76	18-35	1.45-1.55	1.4-4.2	0.18-0.20	1.4-4.5	0.0-0.2
Aquepts, very rubbly-----	0-10	40-72	16-48	6-12	0.80-1.50	4.2-14.1	0.04-0.08	0.0-0.7	6.0-25
	10-28	45-72	26-50	2-12	1.40-1.60	4.2-14.1	0.04-0.13	0.0-0.8	0.5-3.0
	28-102	45-72	26-50	2-12	1.45-1.60	4.2-14.1	0.07-0.17	0.0-0.7	0.3-1.0
	102-200	45-72	16-48	2-12	1.50-1.65	1.4-4.2	0.07-0.16	0.0-0.9	0.0-0.2
Rock outcrop.									
2srqy: Baudette-----	0-5	---	---	---	0.10-0.30	42.3-141.1	0.25-0.45	---	50-80
	5-8	10-20	58-75	15-27	0.70-1.40	4.2-14.1	0.22-0.24	0.5-3.1	2.0-25
	8-20	10-20	59-75	15-27	1.35-1.50	4.2-14.1	0.20-0.24	1.2-3.8	0.5-2.0
	20-35	5-15	56-77	18-30	1.45-1.55	4.2-14.1	0.18-0.22	1.3-3.0	0.2-0.8
	35-70	5-15	50-77	18-35	1.45-1.55	1.4-14.1	0.18-0.22	1.8-5.2	0.2-0.8
	70-90	5-15	59-77	18-30	1.45-1.55	4.2-14.1	0.18-0.22	1.7-4.1	0.0-0.5
	90-200	5-15	59-77	18-30	1.45-1.55	4.2-14.1	0.18-0.22	1.4-3.5	0.0-0.1
Little Swan-----	0-6	---	---	---	0.10-0.30	42.3-141.1	0.25-0.45	---	50-80
	6-16	5-40	45-80	15-27	0.70-1.40	4.2-14.1	0.22-0.24	1.2-2.7	2.0-25
	16-25	5-20	57-80	15-27	1.40-1.55	4.2-14.1	0.20-0.24	1.2-3.8	0.5-2.0
	25-63	5-15	56-77	18-35	1.45-1.55	4.2-14.1	0.20-0.22	1.3-4.0	0.2-0.8
	63-100	5-15	50-76	18-35	1.45-1.55	1.4-4.2	0.18-0.20	1.4-4.5	0.0-0.2
	100-200	5-15	50-76	18-35	1.45-1.55	1.4-4.2	0.18-0.20	1.4-4.5	0.0-0.2
Voyageurs-----	0-7	5-40	42-80	15-27	0.70-1.40	4.2-14.1	0.20-0.24	0.3-3.8	2.0-25
	7-17	5-40	38-80	15-27	1.45-1.55	4.2-14.1	0.20-0.24	0.7-5.6	0.3-4.0
	17-30	0-20	45-80	18-35	1.45-1.55	1.4-14.1	0.18-0.22	1.3-6.8	0.2-0.8
	30-70	0-20	40-74	24-45	1.45-1.55	1.4-14.1	0.18-0.20	2.6-8.5	0.2-0.8
	70-140	45-85	0-40	2-15	1.55-1.65	4.2-141.1	0.04-0.12	0.0-1.3	0.0-0.2
	140-200	---	---	---	---	0.0-1.0	---	---	---
Wahlsten, very stony-----	0-9	35-70	20-50	7-18	0.70-1.40	4.2-14.1	0.09-0.20	0.2-1.3	2.0-25
	9-22	35-70	12-47	7-18	1.45-1.55	4.2-42.3	0.06-0.17	0.2-1.2	0.5-2.0
	22-78	45-85	0-50	2-18	1.50-1.60	4.2-42.3	0.06-0.15	0.1-1.0	0.3-0.9
	78-200	---	---	---	---	0.0-1.0	---	---	---
Insula, very stony, skeletal	0-10	---	---	---	0.10-0.30	42.3-141.1	0.10-0.45	---	50-80
	10-18	45-80	2-46	6-18	0.70-1.45	14.1-42.3	0.10-0.20	0.2-1.2	2.0-25
	18-40	45-80	6-50	2-18	1.45-1.60	14.1-42.3	0.06-0.17	0.1-1.1	0.5-2.0
	40-200	---	---	---	---	0.0-1.0	---	---	---

# Soil Survey of Voyageurs National Park, Minnesota

Table 17.—Physical Soil Properties—Continued

Map unit symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Permeability (Ksat)	Available water capacity	Shrink- swell potential	Organic matter
	<u>Cm</u>	<u>Pct</u>	<u>Pct</u>	<u>Pct</u>	<u>g/cc</u>	<u>um/sec</u>	<u>Cm/cm</u>	<u>Pct</u>	<u>Pct</u>
<b>2srqy:</b>									
Spooner-----	0-15	5-40	45-80	15-27	0.80-1.40	4.2-14.1	0.22-0.24	0.5-3.1	2.0-25
	15-25	5-20	57-80	15-27	1.40-1.50	4.2-14.1	0.20-0.24	1.1-2.6	1.0-3.0
	25-40	5-20	52-77	18-30	1.45-1.55	1.4-14.1	0.18-0.23	1.1-3.9	0.2-0.8
	40-70	5-15	50-75	18-35	1.45-1.55	1.4-14.1	0.18-0.22	1.8-5.2	0.2-0.8
	70-100	5-15	59-77	18-30	1.45-1.55	1.4-14.1	0.18-0.22	1.4-3.7	0.0-0.8
	100-200	5-15	56-77	18-30	1.45-1.55	1.4-14.1	0.18-0.22	1.4-3.6	0.0-0.2
<b>2srqz:</b>									
Canthook-----	0-2	---	---	---	0.20-0.40	4.2-42.3	0.25-0.45	---	35-70
	2-12	45-85	0-50	5-18	0.70-1.45	4.2-14.1	0.13-0.22	0.2-1.5	2.0-25
	12-29	45-90	0-48	2-15	1.40-1.55	4.2-14.1	0.10-0.18	0.0-1.7	0.5-2.0
	29-43	10-45	15-54	20-40	1.40-1.50	0.4-1.4	0.15-0.19	2.1-6.8	0.2-0.8
	43-61	5-45	15-55	24-40	1.40-1.50	1.4-4.2	0.15-0.19	2.8-6.6	0.0-0.2
	61-91	5-45	15-55	24-40	1.40-1.50	1.4-4.2	0.15-0.19	2.8-6.6	0.0-0.2
	91-200	5-30	40-71	24-40	1.45-1.55	1.4-4.2	0.15-0.19	2.1-6.2	0.0-0.2
<b>Durkeelake-----</b>	0-8	52-85	0-43	5-20	0.70-1.40	14.1-42.3	0.10-0.15	0.1-2.3	2.0-25
	8-18	70-90	0-28	2-15	1.50-1.60	42.3-141.1	0.08-0.12	0.1-0.9	0.5-1.0
	18-60	70-90	0-28	2-15	1.55-1.65	42.3-141.1	0.07-0.11	0.1-0.9	0.2-0.8
	60-85	5-40	22-75	20-40	1.45-1.55	1.4-14.1	0.14-0.22	1.7-4.7	0.2-0.8
	85-200	5-40	40-70	25-50	1.45-1.55	1.4-14.1	0.18-0.22	2.3-6.4	0.0-0.2
<b>Bootleg-----</b>	0-9	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
	9-15	25-70	23-70	5-20	0.90-1.40	4.2-14.1	0.13-0.24	0.1-2.3	2.0-25
	15-27	50-90	0-38	2-15	1.40-1.60	42.3-141.1	0.07-0.11	0.1-1.2	1.0-3.0
	27-57	50-90	0-38	2-15	1.55-1.65	42.3-141.1	0.07-0.11	0.1-1.1	0.2-0.8
	57-137	5-20	40-60	35-55	1.45-1.55	0.4-4.2	0.10-0.18	4.9-9.7	0.2-0.8
	137-200	5-30	40-71	24-40	1.45-1.55	0.4-4.2	0.10-0.18	2.3-5.5	0.0-0.2
<b>Udipsammets----</b>	0-7	80-100	0-20	0-10	1.45-1.55	42.3-141.1	0.07-0.10	0.0-0.8	2.0-5.0
	7-9	85-100	0-14	0-8	1.50-1.65	42.3-141.1	0.07-0.09	0.0-0.6	0.5-1.0
	9-40	85-100	0-15	0-8	1.60-1.70	42.3-141.1	0.07-0.09	0.0-0.4	0.0-0.4
	40-72	85-100	0-15	0-8	1.60-1.70	42.3-141.1	0.05-0.07	0.0-0.6	0.0-0.2
	72-113	85-100	0-15	0-8	1.60-1.70	42.3-141.1	0.05-0.09	0.0-0.6	0.0-0.2
	113-200	85-100	0-11	0-5	1.60-1.75	42.3-423.3	0.03-0.07	0.0-0.3	0.0-0.0
<b>Grytal-----</b>	0-6	---	---	---	0.20-0.40	4.2-42.3	0.25-0.45	---	35-70
	6-11	70-90	0-28	0-10	1.55-1.65	42.3-141.1	0.09-0.11	0.1-0.7	0.5-1.0
	11-33	85-100	0-15	0-10	1.60-1.70	42.3-141.1	0.06-0.08	0.1-0.6	0.1-0.5
	33-104	85-100	0-14	0-8	1.60-1.75	42.3-423.3	0.03-0.07	0.0-0.5	0.0-0.2
	104-200	85-100	0-13	0-5	1.60-1.75	42.3-423.3	0.03-0.07	0.0-0.3	0.0-0.0
<b>Voyageurs-----</b>	0-7	5-40	42-80	15-27	0.70-1.40	4.2-14.1	0.20-0.24	0.3-3.8	2.0-25
	7-17	5-40	38-80	15-27	1.45-1.55	4.2-14.1	0.20-0.24	0.7-5.6	0.3-4.0
	17-30	0-20	45-80	18-35	1.45-1.55	1.4-14.1	0.18-0.22	1.3-6.8	0.2-0.8
	30-70	0-20	40-74	24-45	1.45-1.55	1.4-14.1	0.18-0.20	2.6-8.5	0.2-0.8
	70-140	45-85	0-40	2-15	1.55-1.65	4.2-141.1	0.04-0.12	0.0-1.3	0.0-0.2
	140-200	---	---	---	---	0.0-1.0	---	---	---
<b>Aquepts, stony, moderately slow Ksat-----</b>	0-18	23-65	8-50	7-27	0.80-1.40	4.2-14.1	0.17-0.22	0.1-3.1	2.0-25
	18-38	20-65	5-72	7-30	1.45-1.55	4.2-14.1	0.17-0.19	0.3-2.9	0.5-2.0
	38-98	10-30	29-70	20-50	1.45-1.55	1.4-4.2	0.18-0.20	1.4-6.4	0.2-0.8
	98-200	10-95	0-88	1-35	1.45-1.65	4.2-14.1	0.17-0.19	0.0-3.5	0.0-0.2



# Soil Survey of Voyageurs National Park, Minnesota

Table 17.—Physical Soil Properties—Continued

Map unit symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Permeability (Ksat)	Available water capacity	Shrink- swell potential	Organic matter
	<u>Cm</u>	<u>Pct</u>	<u>Pct</u>	<u>Pct</u>	<u>g/cc</u>	<u>um/sec</u>	<u>Cm/cm</u>	<u>Pct</u>	<u>Pct</u>
2srr3: Spooners-----	0-15	5-40	45-80	15-27	0.80-1.40	4.2-14.1	0.22-0.24	0.5-3.1	2.0-25
	15-25	5-20	57-80	15-27	1.40-1.50	4.2-14.1	0.20-0.24	1.1-2.6	1.0-3.0
	25-40	5-20	52-77	18-30	1.45-1.55	1.4-14.1	0.18-0.23	1.1-3.9	0.2-0.8
	40-70	5-15	50-75	18-35	1.45-1.55	1.4-14.1	0.18-0.22	1.8-5.2	0.2-0.8
	70-100	5-15	59-77	18-30	1.45-1.55	1.4-14.1	0.18-0.22	1.4-3.7	0.0-0.8
	100-200	5-15	56-77	18-30	1.45-1.55	1.4-14.1	0.18-0.22	1.4-3.6	0.0-0.2
Sax-----	0-21	---	---	---	0.15-0.35	4.2-42.3	0.35-0.45	---	35-85
	21-31	5-40	43-80	15-27	0.80-1.40	4.2-14.1	0.20-0.24	0.5-2.6	6.0-25
	31-93	5-15	55-77	18-35	1.45-1.55	1.4-14.1	0.20-0.24	1.5-4.7	0.2-0.8
	93-200	5-15	54-80	15-35	1.45-1.55	1.4-14.1	0.20-0.22	1.1-4.5	0.0-0.2
Spooners, till/bedrock substratum-----	0-4	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
	4-14	5-60	25-80	15-27	0.80-1.40	4.2-42.3	0.15-0.24	0.5-3.1	2.0-25
	14-35	5-40	44-80	15-27	1.45-1.55	4.2-14.1	0.20-0.24	1.0-4.7	0.3-4.0
	35-70	0-20	42-76	24-40	1.45-1.55	1.4-14.1	0.18-0.24	3.0-6.2	0.2-0.8
	70-107	45-85	13-50	2-10	1.60-1.70	4.2-141.1	0.04-0.17	0.1-0.9	0.0-0.2
	107-200	---	---	---	---	0.0-1.0	---	---	---
Foglake-----	0-18	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
	18-20	0-40	40-80	15-30	0.80-1.40	1.4-14.1	0.18-0.24	0.3-4.4	2.0-25
	20-38	0-20	50-70	15-30	1.40-1.55	1.4-14.1	0.18-0.20	0.9-4.4	0.5-2.0
	38-90	0-15	40-65	35-50	1.40-1.50	0.4-1.4	0.10-0.20	5.8-9.8	0.2-0.8
	90-100	0-15	46-75	25-40	1.45-1.55	1.4-14.1	0.18-0.22	2.3-6.5	0.0-0.4
	100-200	0-15	53-78	22-35	1.45-1.55	1.4-14.1	0.18-0.22	1.8-5.2	0.0-0.2
Little Swan-----	0-6	---	---	---	0.10-0.30	42.3-141.1	0.25-0.45	---	50-80
	6-16	5-40	45-80	15-27	0.70-1.40	4.2-14.1	0.22-0.24	1.2-2.7	2.0-25
	16-25	5-20	57-80	15-27	1.40-1.55	4.2-14.1	0.20-0.24	1.2-3.8	0.5-2.0
	25-63	5-15	56-77	18-35	1.45-1.55	4.2-14.1	0.20-0.22	1.3-4.0	0.2-0.8
	63-100	5-15	50-76	18-35	1.45-1.55	1.4-4.2	0.18-0.20	1.4-4.5	0.0-0.2
	100-200	5-15	50-76	18-35	1.45-1.55	1.4-4.2	0.18-0.20	1.4-4.5	0.0-0.2
Bootleg-----	0-9	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
	9-15	25-70	23-70	5-20	0.90-1.40	4.2-14.1	0.13-0.24	0.1-2.3	2.0-25
	15-27	50-90	0-38	2-15	1.40-1.60	42.3-141.1	0.07-0.11	0.1-1.2	1.0-3.0
	27-57	50-90	0-38	2-15	1.55-1.65	42.3-141.1	0.07-0.11	0.1-1.1	0.2-0.8
	57-137	5-20	40-60	35-55	1.45-1.55	0.4-4.2	0.10-0.18	4.9-9.7	0.2-0.8
	137-200	5-30	40-71	24-40	1.45-1.55	0.4-4.2	0.10-0.18	2.3-5.5	0.0-0.2
Canthook-----	0-2	---	---	---	0.20-0.40	4.2-42.3	0.25-0.45	---	35-70
	2-12	45-85	0-50	5-18	0.70-1.45	4.2-14.1	0.13-0.22	0.2-1.5	2.0-25
	12-29	45-90	0-48	2-15	1.40-1.55	4.2-14.1	0.10-0.18	0.0-1.7	0.5-2.0
	29-43	10-45	15-54	20-40	1.40-1.50	0.4-1.4	0.15-0.19	2.1-6.8	0.2-0.8
	43-61	5-45	15-55	24-40	1.40-1.50	1.4-4.2	0.15-0.19	2.8-6.6	0.0-0.2
	61-91	5-45	15-55	24-40	1.40-1.50	1.4-4.2	0.15-0.19	2.8-6.6	0.0-0.2
	91-200	5-30	40-71	24-40	1.45-1.55	1.4-4.2	0.15-0.19	2.1-6.2	0.0-0.2
2srr4: Little Swan-----	0-6	---	---	---	0.10-0.30	42.3-141.1	0.25-0.45	---	50-80
	6-16	5-40	45-80	15-27	0.70-1.40	4.2-14.1	0.22-0.24	1.2-2.7	2.0-25
	16-25	5-20	57-80	15-27	1.40-1.55	4.2-14.1	0.20-0.24	1.2-3.8	0.5-2.0
	25-63	5-15	56-77	18-35	1.45-1.55	4.2-14.1	0.20-0.22	1.3-4.0	0.2-0.8
	63-100	5-15	50-76	18-35	1.45-1.55	1.4-4.2	0.18-0.20	1.4-4.5	0.0-0.2
	100-200	5-15	50-76	18-35	1.45-1.55	1.4-4.2	0.18-0.20	1.4-4.5	0.0-0.2

# Soil Survey of Voyageurs National Park, Minnesota

Table 17.—Physical Soil Properties—Continued

Map unit symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Permeability (Ksat)	Available water capacity	Shrink- swell potential	Organic matter
	Cm	Pct	Pct	Pct	g/cc	um/sec	Cm/cm	Pct	Pct
2srr4:									
Spooner-----	0-15	5-40	45-80	15-27	0.80-1.40	4.2-14.1	0.22-0.24	0.5-3.1	2.0-25
	15-25	5-20	57-80	15-27	1.40-1.50	4.2-14.1	0.20-0.24	1.1-2.6	1.0-3.0
	25-40	5-20	52-77	18-30	1.45-1.55	1.4-14.1	0.18-0.23	1.1-3.9	0.2-0.8
	40-70	5-15	50-75	18-35	1.45-1.55	1.4-14.1	0.18-0.22	1.8-5.2	0.2-0.8
	70-100	5-15	59-77	18-30	1.45-1.55	1.4-14.1	0.18-0.22	1.4-3.7	0.0-0.8
	100-200	5-15	56-77	18-30	1.45-1.55	1.4-14.1	0.18-0.22	1.4-3.6	0.0-0.2
Voyageurs-----	0-7	5-40	42-80	15-27	0.70-1.40	4.2-14.1	0.20-0.24	0.3-3.8	2.0-25
	7-17	5-40	38-80	15-27	1.45-1.55	4.2-14.1	0.20-0.24	0.7-5.6	0.3-4.0
	17-30	0-20	45-80	18-35	1.45-1.55	1.4-14.1	0.18-0.22	1.3-6.8	0.2-0.8
	30-70	0-20	40-74	24-45	1.45-1.55	1.4-14.1	0.18-0.20	2.6-8.5	0.2-0.8
	70-140	45-85	0-40	2-15	1.55-1.65	4.2-141.1	0.04-0.12	0.0-1.3	0.0-0.2
	140-200	---	---	---	---	0.0-1.0	---	---	---
Spooner, till/bedrock substratum-----	0-4	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
	4-14	5-60	25-80	15-27	0.80-1.40	4.2-42.3	0.15-0.24	0.5-3.1	2.0-25
	14-35	5-40	44-80	15-27	1.45-1.55	4.2-14.1	0.20-0.24	1.0-4.7	0.3-4.0
	35-70	0-20	42-76	24-40	1.45-1.55	1.4-14.1	0.18-0.24	3.0-6.2	0.2-0.8
	70-107	45-85	13-50	2-10	1.60-1.70	4.2-141.1	0.04-0.17	0.1-0.9	0.0-0.2
	107-200	---	---	---	---	0.0-1.0	---	---	---
Sax-----	0-21	---	---	---	0.15-0.35	4.2-42.3	0.35-0.45	---	35-85
	21-31	5-40	43-80	15-27	0.80-1.40	4.2-14.1	0.20-0.24	0.5-2.6	6.0-25
	31-93	5-15	55-77	18-35	1.45-1.55	1.4-14.1	0.20-0.24	1.5-4.7	0.2-0.8
	93-200	5-15	54-80	15-35	1.45-1.55	1.4-14.1	0.20-0.22	1.1-4.5	0.0-0.2
Foglake-----	0-18	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
	18-20	0-40	40-80	15-30	0.80-1.40	1.4-14.1	0.18-0.24	0.3-4.4	2.0-25
	20-38	0-20	50-70	15-30	1.40-1.55	1.4-14.1	0.18-0.20	0.9-4.4	0.5-2.0
	38-90	0-15	40-65	35-50	1.40-1.50	0.4-1.4	0.10-0.20	5.8-9.8	0.2-0.8
	90-100	0-15	46-75	25-40	1.45-1.55	1.4-14.1	0.18-0.22	2.3-6.5	0.0-0.4
	100-200	0-15	53-78	22-35	1.45-1.55	1.4-14.1	0.18-0.22	1.8-5.2	0.0-0.2
Bootleg-----	0-9	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
	9-15	25-70	23-70	5-20	0.90-1.40	4.2-14.1	0.13-0.24	0.1-2.3	2.0-25
	15-27	50-90	0-38	2-15	1.40-1.60	42.3-141.1	0.07-0.11	0.1-1.2	1.0-3.0
	27-57	50-90	0-38	2-15	1.55-1.65	42.3-141.1	0.07-0.11	0.1-1.1	0.2-0.8
	57-137	5-20	40-60	35-55	1.45-1.55	0.4-4.2	0.10-0.18	4.9-9.7	0.2-0.8
	137-200	5-30	40-71	24-40	1.45-1.55	0.4-4.2	0.10-0.18	2.3-5.5	0.0-0.2
Canthook-----	0-2	---	---	---	0.20-0.40	4.2-42.3	0.25-0.45	---	35-70
	2-12	45-85	0-50	5-18	0.70-1.45	4.2-14.1	0.13-0.22	0.2-1.5	2.0-25
	12-29	45-90	0-48	2-15	1.40-1.55	4.2-14.1	0.10-0.18	0.0-1.7	0.5-2.0
	29-43	10-45	15-54	20-40	1.40-1.50	0.4-1.4	0.15-0.19	2.1-6.8	0.2-0.8
	43-61	5-45	15-55	24-40	1.40-1.50	1.4-4.2	0.15-0.19	2.8-6.6	0.0-0.2
	61-91	5-45	15-55	24-40	1.40-1.50	1.4-4.2	0.15-0.19	2.8-6.6	0.0-0.2
	91-200	5-30	40-71	24-40	1.45-1.55	1.4-4.2	0.15-0.19	2.1-6.2	0.0-0.2
2srr7:									
Mooselake-----	0-60	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
	60-120	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
	120-200	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
Tacoosh, moat---	0-25	---	---	---	0.02-0.15	141.1-705.0	0.55-0.64	---	90-100
	25-125	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
	125-135	5-52	28-80	15-40	0.90-1.45	1.4-14.1	0.17-0.22	0.4-4.2	6.0-25
	135-200	5-45	15-68	15-40	1.40-1.50	1.4-14.1	0.14-0.19	0.5-2.5	0.0-0.2

# Soil Survey of Voyageurs National Park, Minnesota

Table 17.--Physical Soil Properties--Continued

Map unit symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Permeability (Ksat)	Available water capacity	Shrink- swell potential	Organic matter
	<u>Cm</u>	<u>Pct</u>	<u>Pct</u>	<u>Pct</u>	<u>g/cc</u>	<u>um/sec</u>	<u>Cm/cm</u>	<u>Pct</u>	<u>Pct</u>
2srr7:									
Rifle-----	0-30	---	---	---	0.02-0.15	141.1-705.0	0.55-0.65	---	75-100
	30-200	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
Cathro, moat----	0-14	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
	14-42	---	---	---	0.15-0.35	4.2-42.3	0.35-0.45	---	35-85
	42-48	10-50	35-75	15-35	0.80-1.40	4.2-14.1	0.19-0.24	0.4-3.6	6.0-25
	48-62	5-45	15-78	15-40	1.35-1.50	1.4-14.1	0.18-0.23	1.1-5.7	1.0-6.0
	62-200	5-45	15-78	15-40	1.40-1.50	1.4-14.1	0.13-0.16	0.5-2.5	0.0-0.2
2srr8:									
Rifle-----	0-25	---	---	---	0.02-0.15	141.1-705.0	0.55-0.65	---	75-100
	25-200	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
Tacoosh, moat----	0-25	---	---	---	0.02-0.15	141.1-705.0	0.55-0.64	---	90-100
	25-125	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
	125-135	5-52	28-80	15-40	0.90-1.45	1.4-14.1	0.17-0.22	0.4-4.2	6.0-25
	135-200	5-45	15-68	15-40	1.40-1.50	1.4-14.1	0.14-0.19	0.5-2.5	0.0-0.2
Greenwood-----	0-20	---	---	---	0.02-0.15	141.1-705.0	0.55-0.65	---	90-100
	20-200	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
Aquepts, stony, moderately slow Ksat-----	0-18	23-65	8-50	7-27	0.80-1.40	4.2-14.1	0.17-0.22	0.1-3.1	2.0-25
	18-38	20-65	5-72	7-30	1.45-1.55	4.2-14.1	0.17-0.19	0.3-2.9	0.5-2.0
	38-98	10-30	29-70	20-50	1.45-1.55	1.4-4.2	0.18-0.20	1.4-6.4	0.2-0.8
	98-200	10-95	0-88	1-35	1.45-1.65	4.2-14.1	0.17-0.19	0.0-3.5	0.0-0.2
2srr9:									
Tacoosh, frequently flooded-----	0-25	---	---	---	0.02-0.15	141.1-705.0	0.55-0.64	---	90-100
	25-125	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
	125-135	5-52	28-80	15-40	0.90-1.45	1.4-14.1	0.17-0.22	0.4-4.2	6.0-25
	135-200	5-45	15-68	15-40	1.40-1.50	1.4-14.1	0.14-0.19	0.5-2.5	0.0-0.2
Sax, frequently flooded-----	0-21	---	---	---	0.15-0.35	4.2-42.3	0.35-0.45	---	35-85
	21-31	5-40	43-80	15-27	0.80-1.40	4.2-14.1	0.20-0.24	0.5-2.6	6.0-25
	31-93	5-15	55-77	18-35	1.45-1.55	1.4-14.1	0.20-0.24	1.5-4.7	0.2-0.8
	93-200	5-15	54-80	15-35	1.45-1.55	1.4-14.1	0.20-0.22	1.1-4.5	0.0-0.2
Cathro, frequently flooded-----	0-14	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
	14-42	---	---	---	0.15-0.35	4.2-42.3	0.35-0.45	---	35-85
	42-48	10-50	35-75	15-35	0.80-1.40	4.2-14.1	0.19-0.24	0.4-3.6	6.0-25
	48-62	5-45	15-78	15-40	1.35-1.50	1.4-14.1	0.18-0.23	1.1-5.7	1.0-6.0
	62-200	5-45	15-78	15-40	1.40-1.50	1.4-14.1	0.13-0.16	0.5-2.5	0.0-0.2
Rifle, frequently flooded-----	0-125	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
	125-135	---	---	---	0.15-0.35	4.2-42.3	0.35-0.45	---	35-85
	135-200	0-20	40-73	27-40	1.45-1.55	1.4-4.2	0.18-0.20	2.0-4.2	0.0-0.2

# Soil Survey of Voyageurs National Park, Minnesota

Table 17.—Physical Soil Properties—Continued

Map unit symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Permeability (Ksat)	Available water capacity	Shrink- swell potential	Organic matter
	<u>Cm</u>	<u>Pct</u>	<u>Pct</u>	<u>Pct</u>	<u>g/cc</u>	<u>um/sec</u>	<u>Cm/cm</u>	<u>Pct</u>	<u>Pct</u>
2srr9: Hassman, frequently flooded-----	0-19	5-50	28-75	20-40	0.80-1.40	0.4-14.1	0.17-0.22	0.6-6.5	6.0-25
	19-27	0-20	40-73	27-40	1.40-1.50	0.4-4.2	0.18-0.21	3.1-7.6	0.5-2.0
	27-46	0-20	38-65	35-60	1.45-1.55	0.4-1.4	0.10-0.20	5.8-12.7	0.2-0.8
	46-74	0-20	38-65	35-60	1.45-1.55	0.4-1.4	0.10-0.20	5.2-11.9	0.2-0.8
	74-152	0-50	15-65	35-50	1.45-1.55	0.4-1.4	0.10-0.20	5.2-9.2	0.2-0.8
	152-200	0-50	15-65	35-50	1.45-1.55	0.4-1.4	0.10-0.20	4.9-8.9	0.0-0.2
2srrb: Aquets, ponded	0-2	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
	2-6	23-52	28-64	7-27	0.90-1.45	4.2-14.1	0.17-0.22	0.1-2.6	6.0-25
	6-25	23-65	12-70	7-27	1.30-1.45	4.2-14.1	0.17-0.22	0.5-3.5	0.5-4.0
	25-200	15-85	0-83	2-27	1.45-1.55	4.2-141.1	0.04-0.22	0.1-3.1	0.0-0.5
Sax, ponded-----	0-21	---	---	---	0.15-0.35	4.2-42.3	0.35-0.45	---	35-85
	21-31	5-40	43-80	15-27	0.80-1.40	4.2-14.1	0.20-0.24	0.5-2.6	6.0-25
	31-93	5-15	55-77	18-35	1.45-1.55	1.4-14.1	0.20-0.24	1.5-4.7	0.2-0.8
	93-200	5-15	54-80	15-35	1.45-1.55	1.4-14.1	0.20-0.22	1.1-4.5	0.0-0.2
Tacoosh, ponded	0-25	---	---	---	0.02-0.15	141.1-705.0	0.55-0.64	---	90-100
	25-125	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
	125-135	5-52	28-80	15-40	0.90-1.45	1.4-14.1	0.17-0.22	0.4-4.2	6.0-25
	135-200	5-45	15-68	15-40	1.40-1.50	1.4-14.1	0.14-0.19	0.5-2.5	0.0-0.2
Rifle, ponded---	0-125	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
	125-135	---	---	---	0.15-0.35	4.2-42.3	0.35-0.45	---	35-85
	135-200	0-20	40-73	27-40	1.45-1.55	1.4-4.2	0.18-0.20	2.0-4.2	0.0-0.2
Hassman, ponded	0-19	5-50	28-75	20-40	0.80-1.40	0.4-14.1	0.17-0.22	0.6-6.5	6.0-25
	19-27	0-20	40-73	27-40	1.40-1.50	0.4-4.2	0.18-0.21	3.1-7.6	0.5-2.0
	27-46	0-20	38-65	35-60	1.45-1.55	0.4-1.4	0.10-0.20	5.8-12.7	0.2-0.8
	46-74	0-20	38-65	35-60	1.45-1.55	0.4-1.4	0.10-0.20	5.2-11.9	0.2-0.8
	74-152	0-50	15-65	35-50	1.45-1.55	0.4-1.4	0.10-0.20	5.2-9.2	0.2-0.8
	152-200	0-50	15-65	35-50	1.45-1.55	0.4-1.4	0.10-0.20	4.9-8.9	0.0-0.2
2srrh: Greenwood, seasonally ponded-----	0-20	---	---	---	0.02-0.15	141.1-705.0	0.55-0.65	---	90-100
	20-200	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
Merwin, seasonally ponded-----	0-25	---	---	---	0.02-0.15	141.1-705.0	0.55-0.65	---	90-100
	25-60	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
	60-64	5-50	28-80	15-40	0.90-1.45	1.4-14.1	0.18-0.23	0.5-4.2	6.0-25
	64-200	5-50	22-80	15-40	1.45-1.55	1.4-4.2	0.18-0.20	0.8-4.3	0.0-0.2
Rifle, seasonally ponded-----	0-30	---	---	---	0.02-0.15	141.1-705.0	0.55-0.65	---	75-100
	30-200	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
Tacoosh, seasonally ponded-----	0-25	---	---	---	0.02-0.15	141.1-705.0	0.55-0.64	---	90-100
	25-125	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
	125-135	5-52	28-80	15-40	0.90-1.45	1.4-14.1	0.17-0.22	0.4-4.2	6.0-25
	135-200	5-45	15-68	15-40	1.40-1.50	1.4-14.1	0.14-0.19	0.5-2.5	0.0-0.2

# Soil Survey of Voyageurs National Park, Minnesota

Table 17.—Physical Soil Properties—Continued

Map unit symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Permeability (Ksat)	Available water capacity	Shrink- swell potential	Organic matter
	<u>Cm</u>	<u>Pct</u>	<u>Pct</u>	<u>Pct</u>	<u>g/cc</u>	<u>um/sec</u>	<u>Cm/cm</u>	<u>Pct</u>	<u>Pct</u>
2srrj: Rifle, seasonally ponded-----	0-5	---	---	---	0.02-0.15	141.1-705.0	0.55-0.65	---	75-100
	5-140	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
	140-200	---	---	---	0.15-0.35	4.2-42.3	0.35-0.45	---	35-85
Tacoosh, seasonally ponded-----	0-25	---	---	---	0.02-0.15	141.1-705.0	0.55-0.64	---	90-100
	25-125	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
	125-135	5-52	28-80	15-40	0.90-1.45	1.4-14.1	0.17-0.22	0.4-4.2	6.0-25
	135-200	5-45	15-68	15-40	1.40-1.50	1.4-14.1	0.14-0.19	0.5-2.5	0.0-0.2
Greenwood, seasonally ponded-----	0-20	---	---	---	0.02-0.15	141.1-705.0	0.55-0.65	---	90-100
	20-200	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
Aquepts, stony, moderately slow Ksat-----	0-18	23-65	8-50	7-27	0.80-1.40	4.2-14.1	0.17-0.22	0.1-3.1	2.0-25
	18-38	20-65	5-72	7-30	1.45-1.55	4.2-14.1	0.17-0.19	0.3-2.9	0.5-2.0
	38-98	10-30	29-70	20-50	1.45-1.55	1.4-4.2	0.18-0.20	1.4-6.4	0.2-0.8
	98-200	10-95	0-88	1-35	1.45-1.65	4.2-14.1	0.17-0.19	0.0-3.5	0.0-0.2
2srrk: Insula, very stony, skeletal	0-10	---	---	---	0.10-0.30	42.3-141.1	0.10-0.45	---	50-80
	10-18	45-80	2-46	6-18	0.70-1.45	14.1-42.3	0.10-0.20	0.2-1.2	2.0-25
	18-40	45-80	6-50	2-18	1.45-1.60	14.1-42.3	0.06-0.17	0.1-1.1	0.5-2.0
	40-200	---	---	---	---	0.0-1.0	---	---	---
Conic, very stony, skeletal	0-7	40-70	12-50	8-18	0.70-1.40	14.1-42.3	0.07-0.20	0.2-1.2	2.0-25
	7-14	40-70	12-50	4-18	1.45-1.55	14.1-42.3	0.06-0.17	0.2-1.1	0.5-2.0
	14-26	45-70	12-50	2-18	1.50-1.60	14.1-42.3	0.06-0.15	0.1-1.0	0.3-0.9
	26-62	45-85	6-50	1-18	1.50-1.60	14.1-42.3	0.06-0.15	0.1-1.0	0.3-0.9
	62-200	---	---	---	---	0.0-1.0	---	---	---
Wahlsten, very stony-----	0-9	35-70	20-50	7-18	0.70-1.40	4.2-14.1	0.09-0.20	0.2-1.3	2.0-25
	9-22	35-70	12-47	7-18	1.45-1.55	4.2-42.3	0.06-0.17	0.2-1.2	0.5-2.0
	22-78	45-85	0-50	2-18	1.50-1.60	4.2-42.3	0.06-0.15	0.1-1.0	0.3-0.9
	78-200	---	---	---	---	0.0-1.0	---	---	---
Quetico, very stony, skeletal	0-5	45-80	2-46	6-18	0.70-1.40	14.1-42.3	0.08-0.20	0.2-1.2	2.0-25
	5-12	45-80	4-50	2-18	1.45-1.55	14.1-42.3	0.05-0.17	0.1-1.1	0.5-2.0
	12-200	---	---	---	---	0.0-1.0	---	---	---
Metonga, very stony, skeletal	0-10	45-70	12-46	8-18	0.70-1.40	14.1-42.3	0.05-0.20	0.2-1.2	2.0-25
	10-12	45-70	12-48	4-18	1.45-1.55	14.1-42.3	0.05-0.14	0.2-1.1	0.5-2.0
	12-41	45-80	4-50	2-18	1.50-1.60	14.1-42.3	0.05-0.15	0.1-1.1	1.0-5.0
	41-61	45-85	0-50	1-18	1.50-1.60	14.1-42.3	0.07-0.12	0.1-1.0	0.3-0.9
	61-200	---	---	---	---	0.0-1.0	---	---	---

# Soil Survey of Voyageurs National Park, Minnesota

Table 17.—Physical Soil Properties—Continued

Map unit symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Permeability (Ksat)	Available water capacity	Shrink- swell potential	Organic matter
	<u>Cm</u>	<u>Pct</u>	<u>Pct</u>	<u>Pct</u>	<u>g/cc</u>	<u>um/sec</u>	<u>Cm/cm</u>	<u>Pct</u>	<u>Pct</u>
2srrk: Dishno, very stony, skeletal	0-9	45-70	12-46	8-18	0.70-1.40	4.2-42.3	0.07-0.20	0.3-1.1	2.0-25
	9-18	45-70	12-48	6-18	1.45-1.60	4.2-42.3	0.06-0.17	0.2-1.0	0.5-2.0
	18-37	45-80	2-40	6-18	1.50-1.60	4.2-42.3	0.06-0.18	0.2-1.0	1.0-5.0
	37-53	45-80	2-42	6-18	1.50-1.60	4.2-42.3	0.06-0.16	0.2-1.0	1.0-3.0
	53-114	45-90	0-48	6-18	1.50-1.70	4.2-42.3	0.04-0.12	0.2-1.0	0.0-0.5
	114-125	45-90	0-45	2-15	1.55-1.90	0.3-141.1	0.02-0.09	0.1-0.9	0.0-0.2
	125-200	---	---	---	---	0.0-1.0	---	---	---
Aquepts, very rubbly-----	0-10	40-72	16-48	6-12	0.80-1.50	4.2-14.1	0.04-0.08	0.0-0.7	6.0-25
	10-28	45-72	26-50	2-12	1.40-1.60	4.2-14.1	0.04-0.13	0.0-0.8	0.5-3.0
	28-102	45-72	26-50	2-12	1.45-1.60	4.2-14.1	0.07-0.17	0.0-0.7	0.3-1.0
	102-200	45-72	16-48	2-12	1.50-1.65	1.4-4.2	0.07-0.16	0.0-0.9	0.0-0.2
Aquepts, stony, moderately slow Ksat-----	0-18	23-65	8-50	7-27	0.80-1.40	4.2-14.1	0.17-0.22	0.1-3.1	2.0-25
	18-38	20-65	5-72	7-30	1.45-1.55	4.2-14.1	0.17-0.19	0.3-2.9	0.5-2.0
	38-98	10-30	29-70	20-50	1.45-1.55	1.4-4.2	0.18-0.20	1.4-6.4	0.2-0.8
	98-200	10-95	0-88	1-35	1.45-1.65	4.2-14.1	0.17-0.19	0.0-3.5	0.0-0.2
Voyageurs-----	0-7	5-40	42-80	15-27	0.70-1.40	4.2-14.1	0.20-0.24	0.3-3.8	2.0-25
	7-17	5-40	38-80	15-27	1.45-1.55	4.2-14.1	0.20-0.24	0.7-5.6	0.3-4.0
	17-30	0-20	45-80	18-35	1.45-1.55	1.4-14.1	0.18-0.22	1.3-6.8	0.2-0.8
	30-70	0-20	40-74	24-45	1.45-1.55	1.4-14.1	0.18-0.20	2.6-8.5	0.2-0.8
	70-140	45-85	0-40	2-15	1.55-1.65	4.2-141.1	0.04-0.12	0.0-1.3	0.0-0.2
	140-200	---	---	---	---	0.0-1.0	---	---	---
Rock outcrop.									
Foglake-----	0-18	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
	18-20	0-40	40-80	15-30	0.80-1.40	1.4-14.1	0.18-0.24	0.3-4.4	2.0-25
	20-38	0-20	50-70	15-30	1.40-1.55	1.4-14.1	0.18-0.20	0.9-4.4	0.5-2.0
	38-90	0-15	40-65	35-50	1.40-1.50	0.4-1.4	0.10-0.20	5.8-9.8	0.2-0.8
	90-100	0-15	46-75	25-40	1.45-1.55	1.4-14.1	0.18-0.22	2.3-6.5	0.0-0.4
	100-200	0-15	53-78	22-35	1.45-1.55	1.4-14.1	0.18-0.22	1.8-5.2	0.0-0.2
Eaglesnest, very stony-----	0-6	42-70	15-50	7-15	0.70-1.40	4.2-42.3	0.05-0.20	0.2-1.0	2.0-25
	6-27	42-70	15-50	7-15	1.40-1.60	4.2-42.3	0.05-0.17	0.2-0.9	0.5-2.0
	27-79	60-80	15-35	2-10	1.45-1.60	14.1-42.3	0.04-0.15	0.1-0.6	0.2-0.6
	79-102	67-85	10-30	2-8	1.50-1.70	1.4-14.1	0.03-0.13	0.0-0.4	0.0-0.5
	102-200	67-85	10-30	2-8	1.80-1.90	0.3-1.4	0.02-0.06	0.0-0.3	0.0-0.0
2srrl: Tacoosh, occasionally flooded-----	0-25	---	---	---	0.02-0.15	141.1-705.0	0.55-0.64	---	90-100
	25-125	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
	125-135	5-52	28-80	15-40	0.90-1.45	1.4-14.1	0.17-0.22	0.4-4.2	6.0-25
	135-200	5-45	15-68	15-40	1.40-1.50	1.4-14.1	0.14-0.19	0.5-2.5	0.0-0.2
Sax, occasionally flooded-----	0-21	---	---	---	0.15-0.35	4.2-42.3	0.35-0.45	---	35-85
	21-31	5-40	43-80	15-27	0.80-1.40	4.2-14.1	0.20-0.24	0.5-2.6	6.0-25
	31-93	5-15	55-77	18-35	1.45-1.55	1.4-14.1	0.20-0.24	1.5-4.7	0.2-0.8
	93-200	5-15	54-80	15-35	1.45-1.55	1.4-14.1	0.20-0.22	1.1-4.5	0.0-0.2

# Soil Survey of Voyageurs National Park, Minnesota

Table 17.--Physical Soil Properties--Continued

Map unit symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Permeability (Ksat)	Available water capacity	Shrink- swell potential	Organic matter
	<u>Cm</u>	<u>Pct</u>	<u>Pct</u>	<u>Pct</u>	<u>g/cc</u>	<u>um/sec</u>	<u>Cm/cm</u>	<u>Pct</u>	<u>Pct</u>
2srrl: Cathro, occasionally flooded-----	0-14	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
	14-42	---	---	---	0.15-0.35	4.2-42.3	0.35-0.45	---	35-85
	42-48	10-50	35-75	15-35	0.80-1.40	4.2-14.1	0.19-0.24	0.4-3.6	6.0-25
	48-62	5-45	15-78	15-40	1.35-1.50	1.4-14.1	0.18-0.23	1.1-5.7	1.0-6.0
	62-200	5-45	15-78	15-40	1.40-1.50	1.4-14.1	0.13-0.16	0.5-2.5	0.0-0.2
Rifle, occasionally flooded-----	0-125	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
	125-135	---	---	---	0.15-0.35	4.2-42.3	0.35-0.45	---	35-85
	135-200	0-20	40-73	27-40	1.45-1.55	1.4-4.2	0.18-0.20	2.0-4.2	0.0-0.2
Hassman, occasionally flooded-----	0-19	5-50	28-75	20-40	0.80-1.40	0.4-14.1	0.17-0.22	0.6-6.5	6.0-25
	19-27	0-20	40-73	27-40	1.40-1.50	0.4-4.2	0.18-0.21	3.1-7.6	0.5-2.0
	27-46	0-20	38-65	35-60	1.45-1.55	0.4-1.4	0.10-0.20	5.8-12.7	0.2-0.8
	46-74	0-20	38-65	35-60	1.45-1.55	0.4-1.4	0.10-0.20	5.2-11.9	0.2-0.8
	74-152	0-50	15-65	35-50	1.45-1.55	0.4-1.4	0.10-0.20	5.2-9.2	0.2-0.8
	152-200	0-50	15-65	35-50	1.45-1.55	0.4-1.4	0.10-0.20	4.9-8.9	0.0-0.2
2srrm: Brickton-----	0-13	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
	13-20	10-60	25-75	15-27	0.80-1.45	4.2-14.1	0.14-0.24	0.4-3.8	2.0-20
	20-38	5-40	32-80	15-35	1.40-1.50	1.4-14.1	0.18-0.22	0.8-7.7	0.5-2.0
	38-125	0-20	40-65	35-60	1.45-1.55	0.4-1.4	0.10-0.20	5.7-12.7	0.2-0.8
	125-155	0-20	28-60	40-60	1.40-1.50	0.4-1.4	0.10-0.13	6.3-11.9	0.2-0.8
	155-200	0-20	28-60	40-60	1.40-1.50	0.4-1.4	0.10-0.12	5.9-11.5	0.0-0.2
Hassman-----	0-19	5-50	28-75	20-40	0.80-1.40	0.4-14.1	0.17-0.22	0.6-6.5	6.0-25
	19-27	0-20	40-73	27-40	1.40-1.50	0.4-4.2	0.18-0.21	3.1-7.6	0.5-2.0
	27-46	0-20	38-65	35-60	1.45-1.55	0.4-1.4	0.10-0.20	5.8-12.7	0.2-0.8
	46-74	0-20	38-65	35-60	1.45-1.55	0.4-1.4	0.10-0.20	5.2-11.9	0.2-0.8
	74-152	0-50	15-65	35-50	1.45-1.55	0.4-1.4	0.10-0.20	5.2-9.2	0.2-0.8
	152-200	0-50	15-65	35-50	1.45-1.55	0.4-1.4	0.10-0.20	4.9-8.9	0.0-0.2
Spooner, till/bedrock substratum-----	0-4	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
	4-14	5-60	25-80	15-27	0.80-1.40	4.2-42.3	0.15-0.24	0.5-3.1	2.0-25
	14-35	5-40	44-80	15-27	1.45-1.55	4.2-14.1	0.20-0.24	1.0-4.7	0.3-4.0
	35-70	0-20	42-76	24-40	1.45-1.55	1.4-14.1	0.18-0.24	3.0-6.2	0.2-0.8
	70-107	45-85	13-50	2-10	1.60-1.70	4.2-141.1	0.04-0.17	0.1-0.9	0.0-0.2
	107-200	---	---	---	---	0.0-1.0	---	---	---
Foglake-----	0-18	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
	18-20	0-40	40-80	15-30	0.80-1.40	1.4-14.1	0.18-0.24	0.3-4.4	2.0-25
	20-38	0-20	50-70	15-30	1.40-1.55	1.4-14.1	0.18-0.20	0.9-4.4	0.5-2.0
	38-90	0-15	40-65	35-50	1.40-1.50	0.4-1.4	0.10-0.20	5.8-9.8	0.2-0.8
	90-100	0-15	46-75	25-40	1.45-1.55	1.4-14.1	0.18-0.22	2.3-6.5	0.0-0.4
	100-200	0-15	53-78	22-35	1.45-1.55	1.4-14.1	0.18-0.22	1.8-5.2	0.0-0.2
Dalbo-----	0-18	0-30	51-85	15-27	0.70-1.40	4.2-14.1	0.22-0.24	0.9-3.1	2.0-25
	18-38	0-30	52-85	15-27	1.35-1.50	4.2-14.1	0.20-0.22	0.9-4.7	0.5-2.0
	38-69	0-20	32-65	35-60	1.35-1.50	0.4-4.2	0.10-0.20	5.9-13.1	0.2-0.6
	69-85	0-20	32-65	35-60	1.35-1.50	0.4-4.2	0.10-0.20	5.7-12.4	0.2-0.4
	85-118	0-20	35-70	30-60	1.35-1.55	0.4-4.2	0.10-0.20	3.1-11.5	0.0-0.2
	118-200	0-20	30-70	30-60	1.35-1.55	0.4-4.2	0.10-0.20	3.1-11.5	0.0-0.2



# Soil Survey of Voyageurs National Park, Minnesota

Table 17.--Physical Soil Properties--Continued

Map unit symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Permeability (Ksat)	Available water capacity	Shrink- swell potential	Organic matter
	Cm	Pct	Pct	Pct	g/cc	um/sec	Cm/cm	Pct	Pct
2srrm: Bootleg-----	0-9	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
	9-15	25-70	23-70	5-20	0.90-1.40	4.2-14.1	0.13-0.24	0.1-2.3	2.0-25
	15-27	50-90	0-38	2-15	1.40-1.60	42.3-141.1	0.07-0.11	0.1-1.2	1.0-3.0
	27-57	50-90	0-38	2-15	1.55-1.65	42.3-141.1	0.07-0.11	0.1-1.1	0.2-0.8
	57-137	5-20	40-60	35-55	1.45-1.55	0.4-4.2	0.10-0.18	4.9-9.7	0.2-0.8
	137-200	5-30	40-71	24-40	1.45-1.55	0.4-4.2	0.10-0.18	2.3-5.5	0.0-0.2
Tacoosh-----	0-25	---	---	---	0.02-0.15	141.1-705.0	0.55-0.64	---	90-100
	25-125	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
	125-135	5-52	28-80	15-40	0.90-1.45	1.4-14.1	0.17-0.22	0.4-4.2	6.0-25
	135-200	5-45	15-68	15-40	1.40-1.50	1.4-14.1	0.14-0.19	0.5-2.5	0.0-0.2
2srrn: Brickton-----	0-13	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
	13-20	10-60	25-75	15-27	0.80-1.45	4.2-14.1	0.14-0.24	0.4-3.8	2.0-20
	20-38	5-40	32-80	15-35	1.40-1.50	1.4-14.1	0.18-0.22	0.8-7.7	0.5-2.0
	38-125	0-20	40-65	35-60	1.45-1.55	0.4-1.4	0.10-0.20	5.7-12.7	0.2-0.8
	125-155	0-20	28-60	40-60	1.40-1.50	0.4-1.4	0.10-0.13	6.3-11.9	0.2-0.8
	155-200	0-20	28-60	40-60	1.40-1.50	0.4-1.4	0.10-0.12	5.9-11.5	0.0-0.2
Dalbo-----	0-18	0-30	51-85	15-27	0.70-1.40	4.2-14.1	0.22-0.24	0.9-3.1	2.0-25
	18-38	0-30	52-85	15-27	1.35-1.50	4.2-14.1	0.20-0.22	0.9-4.7	0.5-2.0
	38-69	0-20	32-65	35-60	1.35-1.50	0.4-4.2	0.10-0.20	5.9-13.1	0.2-0.6
	69-85	0-20	32-65	35-60	1.35-1.50	0.4-4.2	0.10-0.20	5.7-12.4	0.2-0.4
	85-118	0-20	35-70	30-60	1.35-1.55	0.4-4.2	0.10-0.20	3.1-11.5	0.0-0.2
	118-200	0-20	30-70	30-60	1.35-1.55	0.4-4.2	0.10-0.20	3.1-11.5	0.0-0.2
Voyageurs-----	0-7	5-40	42-80	15-27	0.70-1.40	4.2-14.1	0.20-0.24	0.3-3.8	2.0-25
	7-17	5-40	38-80	15-27	1.45-1.55	4.2-14.1	0.20-0.24	0.7-5.6	0.3-4.0
	17-30	0-20	45-80	18-35	1.45-1.55	1.4-14.1	0.18-0.22	1.3-6.8	0.2-0.8
	30-70	0-20	40-74	24-45	1.45-1.55	1.4-14.1	0.18-0.20	2.6-8.5	0.2-0.8
	70-140	45-85	0-40	2-15	1.55-1.65	4.2-141.1	0.04-0.12	0.0-1.3	0.0-0.2
	140-200	---	---	---	---	0.0-1.0	---	---	---
Foglake-----	0-18	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
	18-20	0-40	40-80	15-30	0.80-1.40	1.4-14.1	0.18-0.24	0.3-4.4	2.0-25
	20-38	0-20	50-70	15-30	1.40-1.55	1.4-14.1	0.18-0.20	0.9-4.4	0.5-2.0
	38-90	0-15	40-65	35-50	1.40-1.50	0.4-1.4	0.10-0.20	5.8-9.8	0.2-0.8
	90-100	0-15	46-75	25-40	1.45-1.55	1.4-14.1	0.18-0.22	2.3-6.5	0.0-0.4
	100-200	0-15	53-78	22-35	1.45-1.55	1.4-14.1	0.18-0.22	1.8-5.2	0.0-0.2
Spooner, till/bedrock substratum-----	0-4	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
	4-14	5-60	25-80	15-27	0.80-1.40	4.2-42.3	0.15-0.24	0.5-3.1	2.0-25
	14-35	5-40	44-80	15-27	1.45-1.55	4.2-14.1	0.20-0.24	1.0-4.7	0.3-4.0
	35-70	0-20	42-76	24-40	1.45-1.55	1.4-14.1	0.18-0.24	3.0-6.2	0.2-0.8
	70-107	45-85	13-50	2-10	1.60-1.70	4.2-141.1	0.04-0.17	0.1-0.9	0.0-0.2
	107-200	---	---	---	---	0.0-1.0	---	---	---
Bootleg-----	0-9	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
	9-15	25-70	23-70	5-20	0.90-1.40	4.2-14.1	0.13-0.24	0.1-2.3	2.0-25
	15-27	50-90	0-38	2-15	1.40-1.60	42.3-141.1	0.07-0.11	0.1-1.2	1.0-3.0
	27-57	50-90	0-38	2-15	1.55-1.65	42.3-141.1	0.07-0.11	0.1-1.1	0.2-0.8
	57-137	5-20	40-60	35-55	1.45-1.55	0.4-4.2	0.10-0.18	4.9-9.7	0.2-0.8
	137-200	5-30	40-71	24-40	1.45-1.55	0.4-4.2	0.10-0.18	2.3-5.5	0.0-0.2

# Soil Survey of Voyageurs National Park, Minnesota

Table 17.—Physical Soil Properties—Continued

Map unit symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Permeability (Ksat)	Available water capacity	Shrink- swell potential	Organic matter
	<u>Cm</u>	<u>Pct</u>	<u>Pct</u>	<u>Pct</u>	<u>g/cc</u>	<u>um/sec</u>	<u>Cm/cm</u>	<u>Pct</u>	<u>Pct</u>
<b>2srrn:</b>									
Hassman-----	0-19	5-50	28-75	20-40	0.80-1.40	0.4-14.1	0.17-0.22	0.6-6.5	6.0-25
	19-27	0-20	40-73	27-40	1.40-1.50	0.4-4.2	0.18-0.21	3.1-7.6	0.5-2.0
	27-46	0-20	38-65	35-60	1.45-1.55	0.4-1.4	0.10-0.20	5.8-12.7	0.2-0.8
	46-74	0-20	38-65	35-60	1.45-1.55	0.4-1.4	0.10-0.20	5.2-11.9	0.2-0.8
	74-152	0-50	15-65	35-50	1.45-1.55	0.4-1.4	0.10-0.20	5.2-9.2	0.2-0.8
	152-200	0-50	15-65	35-50	1.45-1.55	0.4-1.4	0.10-0.20	4.9-8.9	0.0-0.2
<b>2srrq:</b>									
Cathro, ponded--	0-14	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
	14-42	---	---	---	0.15-0.35	4.2-42.3	0.35-0.45	---	35-85
	42-48	10-50	35-75	15-35	0.80-1.40	4.2-14.1	0.19-0.24	0.4-3.6	6.0-25
	48-62	5-45	15-78	15-40	1.35-1.50	1.4-14.1	0.18-0.23	1.1-5.7	1.0-6.0
	62-200	5-45	15-78	15-40	1.40-1.50	1.4-14.1	0.13-0.16	0.5-2.5	0.0-0.2
Tacoosh, ponded	0-25	---	---	---	0.02-0.15	141.1-705.0	0.55-0.64	---	90-100
	25-125	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
	125-135	5-52	28-80	15-40	0.90-1.45	1.4-14.1	0.17-0.22	0.4-4.2	6.0-25
	135-200	5-45	15-68	15-40	1.40-1.50	1.4-14.1	0.14-0.19	0.5-2.5	0.0-0.2
Sax, ponded-----	0-21	---	---	---	0.15-0.35	4.2-42.3	0.35-0.45	---	35-85
	21-31	5-40	43-80	15-27	0.80-1.40	4.2-14.1	0.20-0.24	0.5-2.6	6.0-25
	31-93	5-15	55-77	18-35	1.45-1.55	1.4-14.1	0.20-0.24	1.5-4.7	0.2-0.8
	93-200	5-15	54-80	15-35	1.45-1.55	1.4-14.1	0.20-0.22	1.1-4.5	0.0-0.2
Aquepts, stony, moderately slow Ksat-----	0-18	23-65	8-50	7-27	0.80-1.40	4.2-14.1	0.17-0.22	0.1-3.1	2.0-25
	18-38	20-65	5-72	7-30	1.45-1.55	4.2-14.1	0.17-0.19	0.3-2.9	0.5-2.0
	38-98	10-30	29-70	20-50	1.45-1.55	1.4-4.2	0.18-0.20	1.4-6.4	0.2-0.8
	98-200	10-95	0-88	1-35	1.45-1.65	4.2-14.1	0.17-0.19	0.0-3.5	0.0-0.2
<b>2srrr:</b>									
Insula, very stony-----	0-10	---	---	---	0.10-0.30	42.3-141.1	0.10-0.45	---	50-80
	10-18	45-80	2-46	6-18	0.70-1.45	14.1-42.3	0.10-0.20	0.2-1.2	2.0-25
	18-40	45-80	6-50	2-18	1.45-1.60	14.1-42.3	0.06-0.17	0.1-1.1	0.5-2.0
	40-200	---	---	---	---	0.0-1.0	---	---	---
Voyageurs-----	0-7	5-40	42-80	15-27	0.70-1.40	4.2-14.1	0.20-0.24	0.3-3.8	2.0-25
	7-17	5-40	38-80	15-27	1.45-1.55	4.2-14.1	0.20-0.24	0.7-5.6	0.3-4.0
	17-30	0-20	45-80	18-35	1.45-1.55	1.4-14.1	0.18-0.22	1.3-6.8	0.2-0.8
	30-70	0-20	40-74	24-45	1.45-1.55	1.4-14.1	0.18-0.20	2.6-8.5	0.2-0.8
	70-140	45-85	0-40	2-15	1.55-1.65	4.2-141.1	0.04-0.12	0.0-1.3	0.0-0.2
	140-200	---	---	---	---	0.0-1.0	---	---	---
Wahlsten, very stony-----	0-9	35-70	20-50	7-18	0.70-1.40	4.2-14.1	0.09-0.20	0.2-1.3	2.0-25
	9-22	35-70	12-47	7-18	1.45-1.55	4.2-42.3	0.06-0.17	0.2-1.2	0.5-2.0
	22-78	45-85	0-50	2-18	1.50-1.60	4.2-42.3	0.06-0.15	0.1-1.0	0.3-0.9
	78-200	---	---	---	---	0.0-1.0	---	---	---
Conic, very stony, skeletal	0-7	40-70	12-50	8-18	0.70-1.40	14.1-42.3	0.07-0.20	0.2-1.2	2.0-25
	7-14	40-70	12-50	4-18	1.45-1.55	14.1-42.3	0.06-0.17	0.2-1.1	0.5-2.0
	14-26	45-70	12-50	2-18	1.50-1.60	14.1-42.3	0.06-0.15	0.1-1.0	0.3-0.9
	26-62	45-85	6-50	1-18	1.50-1.60	14.1-42.3	0.06-0.15	0.1-1.0	0.3-0.9
	62-200	---	---	---	---	0.0-1.0	---	---	---

# Soil Survey of Voyageurs National Park, Minnesota

Table 17.—Physical Soil Properties—Continued

Map unit symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Permeability (Ksat)	Available water capacity	Shrink- swell potential	Organic matter
	Cm	Pct	Pct	Pct	g/cc	um/sec	Cm/cm	Pct	Pct
2srrr: Spoooner, till/bedrock substratum-----	0-4	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
	4-14	5-60	25-80	15-27	0.80-1.40	4.2-42.3	0.15-0.24	0.5-3.1	2.0-25
	14-35	5-40	44-80	15-27	1.45-1.55	4.2-14.1	0.20-0.24	1.0-4.7	0.3-4.0
	35-70	0-20	42-76	24-40	1.45-1.55	1.4-14.1	0.18-0.24	3.0-6.2	0.2-0.8
	70-107	45-85	13-50	2-10	1.60-1.70	4.2-141.1	0.04-0.17	0.1-0.9	0.0-0.2
	107-200	---	---	---	---	0.0-1.0	---	---	---
Brickton-----	0-13	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
	13-20	10-60	25-75	15-27	0.80-1.45	4.2-14.1	0.14-0.24	0.4-3.8	2.0-20
	20-38	5-40	32-80	15-35	1.40-1.50	1.4-14.1	0.18-0.22	0.8-7.7	0.5-2.0
	38-125	0-20	40-65	35-60	1.45-1.55	0.4-1.4	0.10-0.20	5.7-12.7	0.2-0.8
	125-155	0-20	28-60	40-60	1.40-1.50	0.4-1.4	0.10-0.13	6.3-11.9	0.2-0.8
	155-200	0-20	28-60	40-60	1.40-1.50	0.4-1.4	0.10-0.12	5.9-11.5	0.0-0.2
Dishno, very stony, skeletal	0-9	45-70	12-46	8-18	0.70-1.40	4.2-42.3	0.07-0.20	0.3-1.1	2.0-25
	9-18	45-70	12-48	6-18	1.45-1.60	4.2-42.3	0.06-0.17	0.2-1.0	0.5-2.0
	18-37	45-80	2-40	6-18	1.50-1.60	4.2-42.3	0.06-0.18	0.2-1.0	1.0-5.0
	37-53	45-80	2-42	6-18	1.50-1.60	4.2-42.3	0.06-0.16	0.2-1.0	1.0-3.0
	53-114	45-90	0-48	6-18	1.50-1.70	4.2-42.3	0.04-0.12	0.2-1.0	0.0-0.5
	114-125	45-90	0-45	2-15	1.55-1.90	0.3-141.1	0.02-0.09	0.1-0.9	0.0-0.2
	125-200	---	---	---	---	0.0-1.0	---	---	---
Aquepts, very rubbly-----	0-10	40-72	16-48	6-12	0.80-1.50	4.2-14.1	0.04-0.08	0.0-0.7	6.0-25
	10-28	45-72	26-50	2-12	1.40-1.60	4.2-14.1	0.04-0.13	0.0-0.8	0.5-3.0
	28-102	45-72	26-50	2-12	1.45-1.60	4.2-14.1	0.07-0.17	0.0-0.7	0.3-1.0
	102-200	45-72	16-48	2-12	1.50-1.65	1.4-4.2	0.07-0.16	0.0-0.9	0.0-0.2
Aquepts, stony, moderately slow Ksat-----	0-18	23-65	8-50	7-27	0.80-1.40	4.2-14.1	0.17-0.22	0.1-3.1	2.0-25
	18-38	20-65	5-72	7-30	1.45-1.55	4.2-14.1	0.17-0.19	0.3-2.9	0.5-2.0
	38-98	10-30	29-70	20-50	1.45-1.55	1.4-4.2	0.18-0.20	1.4-6.4	0.2-0.8
	98-200	10-95	0-88	1-35	1.45-1.65	4.2-14.1	0.17-0.19	0.0-3.5	0.0-0.2
Rock outcrop.									
2srtr: Bowstring, frequently flooded-----	0-155	---	---	---	0.15-0.35	4.2-42.3	0.35-0.45	---	35-85
	155-156	30-100	0-70	0-10	0.80-1.45	4.2-141.1	0.05-0.22	0.0-1.3	1.0-15
	156-185	---	---	---	0.15-0.35	4.2-42.3	0.35-0.45	---	35-85
	185-200	23-65	24-72	5-20	1.45-1.55	4.2-42.3	0.14-0.22	0.2-1.5	0.0-0.5
Fluvaquents, frequently flooded-----	0-15	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
	15-25	23-52	28-50	7-27	0.90-1.45	4.2-14.1	0.17-0.22	0.1-3.1	2.0-25
	25-40	23-65	9-70	7-27	1.45-1.55	4.2-14.1	0.17-0.19	0.4-3.1	0.0-0.5
	40-64	23-65	12-70	7-27	1.25-1.45	4.2-14.1	0.17-0.22	0.2-3.3	1.0-15
	64-200	15-85	0-70	2-27	1.45-1.60	4.2-141.1	0.06-0.22	0.1-2.9	0.0-0.2

# Soil Survey of Voyageurs National Park, Minnesota

Table 17.—Physical Soil Properties—Continued

Map unit symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Permeability (Ksat)	Available water capacity	Shrink- swell potential	Organic matter
	<u>Cm</u>	<u>Pct</u>	<u>Pct</u>	<u>Pct</u>	<u>g/cc</u>	<u>um/sec</u>	<u>Cm/cm</u>	<u>Pct</u>	<u>Pct</u>
2srrt: Cathro, frequently flooded-----	0-14	---	---	---	0.08-0.25	42.3-141.1	0.45-0.55	---	75-100
	14-42	---	---	---	0.15-0.35	4.2-42.3	0.35-0.45	---	35-85
	42-48	10-50	35-75	15-35	0.80-1.40	4.2-14.1	0.19-0.24	0.4-3.6	6.0-25
	48-62	5-45	15-78	15-40	1.35-1.50	1.4-14.1	0.18-0.23	1.1-5.7	1.0-6.0
	62-200	5-45	15-78	15-40	1.40-1.50	1.4-14.1	0.13-0.16	0.5-2.5	0.0-0.2
W. Water									

# Soil Survey of Voyageurs National Park, Minnesota

Table 18.—Erosion Properties

(Entries under "Erosion factors" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodibility index" apply only to the surface layer)

Map symbol and soil name	Depth (cm)	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
		Kw	Kf	T		
2srmd:						
Quetico, bouldery-----	0-1	---	---	1	3	86
	1-5	.28	.28			
	5-20	.24	.37			
	20-200	---	---			
Insula, bouldery-----	0-4	---	---	1	3	86
	4-10	.28	.28			
	10-18	.24	.37			
	18-29	.24	.37			
	29-200	---	---			
Rock outcrop.						
Wahlsten, bouldery, skeletal-----	0-5	---	---	2	6	48
	5-8	.05	.17			
	8-28	.10	.28			
	28-69	.15	.32			
	69-94	.17	.43			
	94-200	---	---			
Conic, bouldery, skeletal-----	0-3	---	---	2	6	48
	3-7	.05	.17			
	7-14	.10	.28			
	14-26	.15	.37			
	26-62	.15	.37			
	62-200	---	---			
Arcadian, very stony-----	0-6	---	---	1	6	48
	6-7	.10	.28			
	7-14	.15	.43			
	14-21	.10	.37			
	21-41	.20	.43			
	41-200	---	---			
2srqm:						
Quetico, bouldery-----	0-1	---	---	1	3	86
	1-5	.28	.28			
	5-20	.24	.37			
	20-200	---	---			
Insula, bouldery-----	0-4	---	---	1	3	86
	4-10	.28	.28			
	10-18	.24	.37			
	18-29	.24	.37			
	29-200	---	---			
Rock outcrop.						
Conic, bouldery, skeletal-----	0-3	---	---	2	6	48
	3-7	.05	.17			
	7-14	.10	.28			
	14-26	.15	.37			
	26-62	.15	.37			
	62-200	---	---			

# Soil Survey of Voyageurs National Park, Minnesota

Table 18.—Erosion Properties—Continued

Map symbol and soil name	Depth (cm)	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
		Kw	Kf	T		
2srqm:						
Arcadian, very stony-----	0-6	---	---	1	6	48
	6-7	.10	.28			
	7-14	.15	.43			
	14-21	.10	.37			
	21-41	.20	.43			
	41-200	---	---			
2srqn:						
Insula, very bouldery, skeletal-----	0-10	---	---	1	6	48
	10-18	.10	.32			
	18-40	.15	.49			
	40-200	---	---			
Conic, very bouldery, skeletal-----	0-7	.10	.24	2	6	48
	7-14	.15	.43			
	14-26	.17	.55			
	26-62	.17	.55			
	62-200	---	---			
Rock outcrop.						
Metonga, very stony, skeletal-----	0-10	.05	.17	2	6	48
	10-12	.10	.32			
	12-41	.10	.37			
	41-61	.20	.43			
	61-200	---	---			
Quetico, very bouldery, skeletal-----	0-5	.15	.32	1	6	48
	5-12	.15	.43			
	12-200	---	---			
Wahlsten, very stony-----	0-9	.10	.32	2	7	38
	9-22	.15	.28			
	22-78	.17	.28			
	78-200	---	---			
Voyageurs-----	0-7	.37	.37	3	6	48
	7-17	.49	.49			
	17-30	.49	.49			
	30-70	.37	.37			
	70-140	.10	.24			
	140-200	---	---			
Aquepts, very rubbly-----	0-10	.05	.20	5	8	0
	10-28	.10	.43			
	28-102	.24	.49			
	102-200	.20	.37			
2srqp:						
Quetico, very bouldery, skeletal-----	0-5	.15	.32	1	6	48
	5-12	.15	.43			
	12-200	---	---			
Insula, very bouldery, skeletal-----	0-10	---	---	1	6	48
	10-18	.10	.32			
	18-40	.15	.49			
	40-200	---	---			
Greenwood-----	0-20	---	---	2	7	38
	20-200	---	---			
Rock outcrop.						

# Soil Survey of Voyageurs National Park, Minnesota

Table 18.—Erosion Properties—Continued

Map symbol and soil name	Depth (cm)	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
		Kw	Kf	T		
2srqp:						
Merwin-----	0-25	---	---	1	7	38
	25-60	---	---			
	60-64	.32	.32			
	64-200	.49	.49			
Aquepts, very rubbly-----	0-10	.05	.20	5	8	0
	10-28	.10	.43			
	28-102	.24	.49			
	102-200	.20	.37			
Wahlsten, very stony-----	0-9	.10	.32	2	7	38
	9-22	.15	.28			
	22-78	.17	.28			
	78-200	---	---			
Conic, very bouldery, skeletal-----	0-7	.10	.24	2	6	48
	7-14	.15	.43			
	14-26	.17	.55			
	26-62	.17	.55			
	62-200	---	---			
2srqr:						
Greenwood-----	0-20	---	---	2	7	38
	20-200	---	---			
Merwin-----	0-25	---	---	1	7	38
	25-60	---	---			
	60-64	.32	.32			
	64-200	.49	.49			
Rifle, moat-----	0-125	---	---	1	5	56
	125-135	---	---			
	135-200	.43	.43			
Tacoosh, moat-----	0-25	---	---	1	7	38
	25-125	---	---			
	125-135	.28	.28			
	135-200	.32	.32			
2srqs:						
Insula, very stony, skeletal-----	0-10	---	---	1	6	48
	10-18	.10	.32			
	18-40	.15	.49			
	40-200	---	---			
Conic, very stony, skeletal-----	0-7	.10	.24	2	6	48
	7-14	.15	.43			
	14-26	.17	.55			
	26-62	.17	.55			
	62-200	---	---			
Wahlsten, very stony-----	0-9	.10	.32	2	7	38
	9-22	.15	.28			
	22-78	.17	.28			
	78-200	---	---			
Quetico, very stony, skeletal-----	0-5	.15	.32	1	6	48
	5-12	.15	.43			
	12-200	---	---			



# Soil Survey of Voyageurs National Park, Minnesota

Table 18.—Erosion Properties—Continued

Map symbol and soil name	Depth (cm)	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
		Kw	Kf	T		
2srqs:						
Metonga, very stony, skeletal-----	0-10	.05	.17	2	6	48
	10-12	.10	.32			
	12-41	.10	.37			
	41-61	.20	.43			
	61-200	---	---			
Dishno, very stony, skeletal-----	0-9	.05	.17	3	6	48
	9-18	.10	.32			
	18-37	.05	.20			
	37-53	.15	.24			
	53-114	.17	.28			
	114-125	.24	.37			
	125-200	---	---			
Aquepts, very rubbly-----	0-10	.05	.20	5	8	0
	10-28	.10	.43			
	28-102	.24	.49			
	102-200	.20	.37			
Aquepts, stony, moderately slow Ksat---	0-18	.28	.28	5	5	56
	18-38	.37	.37			
	38-98	.49	.49			
	98-200	.28	.49			
Voyageurs-----	0-7	.37	.37	3	6	48
	7-17	.49	.49			
	17-30	.49	.49			
	30-70	.37	.37			
	70-140	.10	.24			
	140-200	---	---			
Rock outcrop.						
Foglake-----	0-18	---	---	5	6	48
	18-20	.37	.37			
	20-38	.49	.49			
	38-90	.37	.37			
	90-100	.43	.43			
	100-200	.49	.49			
Eaglesnest, very stony-----	0-6	.10	.20	4	8	0
	6-27	.10	.32			
	27-79	.10	.32			
	79-102	.10	.32			
	102-200	.10	.32			
2srqv:						
Voyageurs, oxyaquic-----	0-5	---	---	3	6	48
	5-8	.37	.37			
	8-22	.55	.55			
	22-76	.43	.43			
	76-87	.64	.64			
	87-101	.05	.20			
	101-200	---	---			
Conic, very stony, skeletal-----	0-7	.10	.24	2	6	48
	7-14	.15	.43			
	14-26	.17	.55			
	26-62	.17	.55			
	62-200	---	---			

# Soil Survey of Voyageurs National Park, Minnesota

Table 18.—Erosion Properties—Continued

Map symbol and soil name	Depth (cm)	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
		Kw	Kf	T		
2srqv:						
Little Swan-----	0-6	---	---	5	6	48
	6-16	.32	.32			
	16-25	.55	.55			
	25-63	.55	.55			
	63-100	.49	.49			
	100-200	.49	.49			
Insula, very stony, skeletal-----	0-10	---	---	1	6	48
	10-18	.10	.32			
	18-40	.15	.49			
	40-200	---	---			
Wahlsten, very stony-----	0-9	.10	.32	2	7	38
	9-22	.15	.28			
	22-78	.17	.28			
	78-200	---	---			
Metonga, very stony, skeletal-----	0-10	.05	.17	2	6	48
	10-12	.10	.32			
	12-41	.10	.37			
	41-61	.20	.43			
	61-200	---	---			
Baudette-----	0-5	---	---	5	6	48
	5-8	.37	.37			
	8-20	.49	.49			
	20-35	.49	.49			
	35-70	.49	.49			
	70-90	.49	.49			
	90-200	.49	.49			
Aquepts, stony, moderately slow Ksat---	0-18	.28	.28	5	5	56
	18-38	.37	.37			
	38-98	.49	.49			
	98-200	.28	.49			
Rock outcrop.						
2srqw:						
Wahlsten, very stony-----	0-9	.10	.32	2	7	38
	9-22	.15	.28			
	22-78	.17	.28			
	78-200	---	---			
Spooner-----	0-15	.37	.37	5	6	48
	15-25	.49	.49			
	25-40	.49	.49			
	40-70	.43	.43			
	70-100	.49	.49			
	100-200	.49	.49			
Voyageurs-----	0-7	.37	.37	3	6	48
	7-17	.49	.49			
	17-30	.49	.49			
	30-70	.37	.37			
	70-140	.10	.24			
	140-200	---	---			
Insula, very stony, skeletal-----	0-10	---	---	1	6	48
	10-18	.10	.32			
	18-40	.15	.49			
	40-200	---	---			

# Soil Survey of Voyageurs National Park, Minnesota

Table 18.—Erosion Properties—Continued

Map symbol and soil name	Depth (cm)	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
		Kw	Kf	T		
2srqw:						
Dishno, very stony, skeletal-----	0-9	.05	.17	3	6	48
	9-18	.10	.32			
	18-37	.05	.20			
	37-53	.15	.24			
	53-114	.17	.28			
	114-125	.24	.37			
	125-200	---	---			
Aquepts, stony, moderately slow Ksat---	0-18	.28	.28	5	5	56
	18-38	.37	.37			
	38-98	.49	.49			
	98-200	.28	.49			
Little Swan-----	0-6	---	---	5	6	48
	6-16	.32	.32			
	16-25	.55	.55			
	25-63	.55	.55			
	63-100	.49	.49			
	100-200	.49	.49			
Aquepts, very rubbly-----	0-10	.05	.20	5	8	0
	10-28	.10	.43			
	28-102	.24	.49			
	102-200	.20	.37			
Rock outcrop.						
2srqy:						
Baudette-----	0-5	---	---	5	6	48
	5-8	.37	.37			
	8-20	.49	.49			
	20-35	.49	.49			
	35-70	.49	.49			
	70-90	.49	.49			
	90-200	.49	.49			
Little Swan-----	0-6	---	---	5	6	48
	6-16	.32	.32			
	16-25	.55	.55			
	25-63	.55	.55			
	63-100	.49	.49			
	100-200	.49	.49			
Voyageurs-----	0-7	.37	.37	3	6	48
	7-17	.49	.49			
	17-30	.49	.49			
	30-70	.37	.37			
	70-140	.10	.24			
	140-200	---	---			
Wahlsten, very stony-----	0-9	.10	.32	2	7	38
	9-22	.15	.28			
	22-78	.17	.28			
	78-200	---	---			
Insula, very stony, skeletal-----	0-10	---	---	1	6	48
	10-18	.10	.32			
	18-40	.15	.49			
	40-200	---	---			

# Soil Survey of Voyageurs National Park, Minnesota

Table 18.—Erosion Properties—Continued

Map symbol and soil name	Depth (cm)	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
		Kw	Kf	T		
2srqz: Spooners-----	0-15	.37	.37	5	6	48
	15-25	.49	.49			
	25-40	.49	.49			
	40-70	.43	.43			
	70-100	.49	.49			
	100-200	.49	.49			
2srqz: Canthook-----	0-2	---	---	5	3	86
	2-12	.28	.28			
	12-29	.32	.32			
	29-43	.32	.32			
	43-61	.28	.28			
	61-91	.28	.28			
	91-200	.37	.37			
Durkeelake-----	0-8	.17	.17	5	3	86
	8-18	.24	.24			
	18-60	.28	.28			
	60-85	.43	.43			
	85-200	.49	.49			
Bootleg-----	0-9	---	---	4	5	56
	9-15	.37	.37			
	15-27	.28	.28			
	27-57	.32	.32			
	57-137	.32	.32			
	137-200	.37	.37			
Udipsammets-----	0-7	.10	.10	5	1	250
	7-9	.15	.15			
	9-40	.15	.15			
	40-72	.15	.15			
	72-113	.15	.15			
	113-200	.10	.10			
Grytal-----	0-6	---	---	5	2	134
	6-11	.20	.20			
	11-33	.10	.10			
	33-104	.10	.10			
	104-200	.15	.15			
Voyageurs-----	0-7	.37	.37	3	6	48
	7-17	.49	.49			
	17-30	.49	.49			
	30-70	.37	.37			
	70-140	.10	.24			
	140-200	---	---			
Aquepts, stony, moderately slow Ksat---	0-18	.28	.28	5	5	56
	18-38	.37	.37			
	38-98	.49	.49			
	98-200	.28	.49			
2srr3: Spooners-----	0-15	.37	.37	5	6	48
	15-25	.49	.49			
	25-40	.49	.49			
	40-70	.43	.43			
	70-100	.49	.49			
	100-200	.49	.49			

# Soil Survey of Voyageurs National Park, Minnesota

Table 18.—Erosion Properties—Continued

Map symbol and soil name	Depth (cm)	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
		Kw	Kf	T		
2srr3:						
Sax-----	0-21	---	---	1	2	134
	21-31	.32	.32			
	31-93	.49	.49			
	93-200	.55	.55			
Spooner, till/bedrock substratum-----	0-4	---	---	3	6	48
	4-14	.37	.37			
	14-35	.49	.49			
	35-70	.43	.43			
	70-107	.37	.64			
	107-200	---	---			
Foglake-----	0-18	---	---	5	6	48
	18-20	.37	.37			
	20-38	.49	.49			
	38-90	.37	.37			
	90-100	.43	.43			
	100-200	.49	.49			
Little Swan-----	0-6	---	---	5	6	48
	6-16	.32	.32			
	16-25	.55	.55			
	25-63	.55	.55			
	63-100	.49	.49			
	100-200	.49	.49			
Bootleg-----	0-9	---	---	4	5	56
	9-15	.37	.37			
	15-27	.28	.28			
	27-57	.32	.32			
	57-137	.32	.32			
	137-200	.37	.37			
Canthook-----	0-2	---	---	5	3	86
	2-12	.28	.28			
	12-29	.32	.32			
	29-43	.32	.32			
	43-61	.28	.28			
	61-91	.28	.28			
	91-200	.37	.37			
2srr4:						
Little Swan-----	0-6	---	---	5	6	48
	6-16	.32	.32			
	16-25	.55	.55			
	25-63	.55	.55			
	63-100	.49	.49			
	100-200	.49	.49			
Spooner-----	0-15	.37	.37	5	6	48
	15-25	.49	.49			
	25-40	.49	.49			
	40-70	.43	.43			
	70-100	.49	.49			
	100-200	.49	.49			
Voyageurs-----	0-7	.37	.37	3	6	48
	7-17	.49	.49			
	17-30	.49	.49			
	30-70	.37	.37			
	70-140	.10	.24			
	140-200	---	---			

# Soil Survey of Voyageurs National Park, Minnesota

Table 18.—Erosion Properties—Continued

Map symbol and soil name	Depth (cm)	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
		Kw	Kf	T		
2srr4:						
Spooner, till/bedrock substratum-----	0-4	---	---	3	6	48
	4-14	.37	.37			
	14-35	.49	.49			
	35-70	.43	.43			
	70-107	.37	.64			
	107-200	---	---			
Sax-----	0-21	---	---	1	2	134
	21-31	.32	.32			
	31-93	.49	.49			
	93-200	.55	.55			
Foglake-----	0-18	---	---	5	6	48
	18-20	.37	.37			
	20-38	.49	.49			
	38-90	.37	.37			
	90-100	.43	.43			
	100-200	.49	.49			
Bootleg-----	0-9	---	---	4	5	56
	9-15	.37	.37			
	15-27	.28	.28			
	27-57	.32	.32			
	57-137	.32	.32			
	137-200	.37	.37			
Canthook-----	0-2	---	---	5	3	86
	2-12	.28	.28			
	12-29	.32	.32			
	29-43	.32	.32			
	43-61	.28	.28			
	61-91	.28	.28			
	91-200	.37	.37			
2srr7:						
Mooselake-----	0-60	---	---	2	5	56
	60-120	---	---			
	120-200	---	---			
Tacoosh, moat-----	0-25	---	---	1	7	38
	25-125	---	---			
	125-135	.28	.28			
	135-200	.32	.32			
Rifle-----	0-30	---	---	1	5	56
	30-200	---	---			
Cathro, moat-----	0-14	---	---	1	5	56
	14-42	---	---			
	42-48	.37	.37			
	48-62	.37	.37			
	62-200	.37	.37			
2srr8:						
Rifle-----	0-25	---	---	2	7	38
	25-200	---	---			
Tacoosh, moat-----	0-25	---	---	1	7	38
	25-125	---	---			
	125-135	.28	.28			
	135-200	.32	.32			

# Soil Survey of Voyageurs National Park, Minnesota

Table 18.—Erosion Properties—Continued

Map symbol and soil name	Depth (cm)	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
		Kw	Kf	T		
2srr8:						
Greenwood-----	0-20	---	---	2	7	38
	20-200	---	---			
Aquepts, stony, moderately slow Ksat---	0-18	.28	.28	5	5	56
	18-38	.37	.37			
	38-98	.49	.49			
	98-200	.28	.49			
2srr9:						
Tacoosh, frequently flooded-----	0-25	---	---	1	8	0
	25-125	---	---			
	125-135	.28	.28			
	135-200	.32	.32			
Sax, frequently flooded-----	0-21	---	---	1	8	0
	21-31	.32	.32			
	31-93	.49	.49			
	93-200	.55	.55			
Cathro, frequently flooded-----	0-14	---	---	1	8	0
	14-42	---	---			
	42-48	.37	.37			
	48-62	.37	.37			
	62-200	.37	.37			
Rifle, frequently flooded-----	0-125	---	---	1	8	0
	125-135	---	---			
	135-200	.43	.43			
Hassman, frequently flooded-----	0-19	.28	.28	5	8	0
	19-27	.37	.37			
	27-46	.43	.43			
	46-74	.43	.43			
	74-152	.43	.43			
	152-200	.43	.43			
2srrb:						
Aquents, ponded-----	0-2	---	---	5	8	0
	2-6	.24	.24			
	6-25	.32	.32			
	25-200	.43	.43			
Sax, ponded-----	0-21	---	---	1	2	134
	21-31	.32	.32			
	31-93	.49	.49			
	93-200	.55	.55			
Tacoosh, ponded-----	0-25	---	---	1	7	38
	25-125	---	---			
	125-135	.28	.28			
	135-200	.32	.32			
Rifle, ponded-----	0-125	---	---	1	5	56
	125-135	---	---			
	135-200	.43	.43			
Hassman, ponded-----	0-19	.28	.28	5	6	48
	19-27	.37	.37			
	27-46	.43	.43			
	46-74	.43	.43			
	74-152	.43	.43			
	152-200	.43	.43			



# Soil Survey of Voyageurs National Park, Minnesota

Table 18.—Erosion Properties—Continued

Map symbol and soil name	Depth (cm)	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
		Kw	Kf	T		
2srrh:						
Greenwood, seasonally ponded-----	0-20	---	---	2	8	0
	20-200	---	---			
Merwin, seasonally ponded-----	0-25	---	---	1	8	0
	25-60	---	---			
	60-64	.32	.32			
	64-200	.49	.49			
Rifle, seasonally ponded-----	0-30	---	---	1	8	0
	30-200	---	---			
Tacoosh, seasonally ponded-----	0-25	---	---	1	8	0
	25-125	---	---			
	125-135	.28	.28			
	135-200	.32	.32			
2srrj:						
Rifle, seasonally ponded-----	0-5	---	---	2	8	0
	5-140	---	---			
	140-200	---	---			
Tacoosh, seasonally ponded-----	0-25	---	---	1	8	0
	25-125	---	---			
	125-135	.28	.28			
	135-200	.32	.32			
Greenwood, seasonally ponded-----	0-20	---	---	2	8	0
	20-200	---	---			
Aquepts, stony, moderately slow Ksat---	0-18	.28	.28	5	5	56
	18-38	.37	.37			
	38-98	.49	.49			
	98-200	.28	.49			
2srrk:						
Insula, very stony, skeletal-----	0-10	---	---	1	6	48
	10-18	.10	.32			
	18-40	.15	.49			
	40-200	---	---			
Conic, very stony, skeletal-----	0-7	.10	.24	2	6	48
	7-14	.15	.43			
	14-26	.17	.55			
	26-62	.17	.55			
	62-200	---	---			
Wahlsten, very stony-----	0-9	.10	.32	2	7	38
	9-22	.15	.28			
	22-78	.17	.28			
	78-200	---	---			
Quetico, very stony, skeletal-----	0-5	.15	.32	1	6	48
	5-12	.15	.43			
	12-200	---	---			
Metonga, very stony, skeletal-----	0-10	.05	.17	2	6	48
	10-12	.10	.32			
	12-41	.10	.37			
	41-61	.20	.43			
	61-200	---	---			

# Soil Survey of Voyageurs National Park, Minnesota

Table 18.—Erosion Properties—Continued

Map symbol and soil name	Depth (cm)	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
		Kw	Kf	T		
2srrk:						
Dishno, very stony, skeletal-----	0-9	.05	.17	3	6	48
	9-18	.10	.32			
	18-37	.05	.20			
	37-53	.15	.24			
	53-114	.17	.28			
	114-125	.24	.37			
	125-200	---	---			
Aquepts, very rubbly-----	0-10	.05	.20	5	8	0
	10-28	.10	.43			
	28-102	.24	.49			
	102-200	.20	.37			
Aquepts, stony, moderately slow Ksat---	0-18	.28	.28	5	5	56
	18-38	.37	.37			
	38-98	.49	.49			
	98-200	.28	.49			
Voyageurs-----	0-7	.37	.37	3	6	48
	7-17	.49	.49			
	17-30	.49	.49			
	30-70	.37	.37			
	70-140	.10	.24			
	140-200	---	---			
Rock outcrop.						
Foglake-----	0-18	---	---	5	6	48
	18-20	.37	.37			
	20-38	.49	.49			
	38-90	.37	.37			
	90-100	.43	.43			
	100-200	.49	.49			
Eaglesnest, very stony-----	0-6	.10	.20	4	5	56
	6-27	.10	.32			
	27-79	.10	.32			
	79-102	.10	.32			
	102-200	.10	.32			
2srrl:						
Tacoosh, occasionally flooded-----	0-25	---	---	1	7	38
	25-125	---	---			
	125-135	.28	.28			
	135-200	.32	.32			
Sax, occasionally flooded-----	0-21	---	---	1	2	134
	21-31	.32	.32			
	31-93	.49	.49			
	93-200	.55	.55			
Cathro, occasionally flooded-----	0-14	---	---	1	5	56
	14-42	---	---			
	42-48	.37	.37			
	48-62	.37	.37			
	62-200	.37	.37			
Rifle, occasionally flooded-----	0-125	---	---	1	5	56
	125-135	---	---			
	135-200	.43	.43			

# Soil Survey of Voyageurs National Park, Minnesota

Table 18.—Erosion Properties—Continued

Map symbol and soil name	Depth (cm)	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
		Kw	Kf	T		
2srrl: Hassman, occasionally flooded-----	0-19	.28	.28	5	6	48
	19-27	.37	.37			
	27-46	.43	.43			
	46-74	.43	.43			
	74-152	.43	.43			
	152-200	.43	.43			
2srrm: Brickton-----	0-13	---	---	5	6	48
	13-20	.43	.43			
	20-38	.49	.49			
	38-125	.37	.37			
	125-155	.32	.32			
	155-200	.32	.32			
Hassman-----	0-19	.28	.28	5	6	48
	19-27	.37	.37			
	27-46	.43	.43			
	46-74	.43	.43			
	74-152	.43	.43			
	152-200	.43	.43			
Spooner, till/bedrock substratum-----	0-4	---	---	3	6	48
	4-14	.37	.37			
	14-35	.49	.49			
	35-70	.43	.43			
	70-107	.37	.64			
	107-200	---	---			
Foglake-----	0-18	---	---	5	6	48
	18-20	.37	.37			
	20-38	.49	.49			
	38-90	.37	.37			
	90-100	.43	.43			
	100-200	.49	.49			
Dalbo-----	0-18	.37	.37	3	6	48
	18-38	.55	.55			
	38-69	.37	.37			
	69-85	.37	.37			
	85-118	.43	.43			
	118-200	.37	.37			
Bootleg-----	0-9	---	---	4	5	56
	9-15	.37	.37			
	15-27	.28	.28			
	27-57	.32	.32			
	57-137	.32	.32			
	137-200	.37	.37			
Tacoosh-----	0-25	---	---	1	7	38
	25-125	---	---			
	125-135	.28	.28			
	135-200	.32	.32			
2srrn: Brickton-----	0-13	---	---	5	6	48
	13-20	.43	.43			
	20-38	.49	.49			
	38-125	.37	.37			
	125-155	.32	.32			
	155-200	.32	.32			

# Soil Survey of Voyageurs National Park, Minnesota

Table 18.—Erosion Properties—Continued

Map symbol and soil name	Depth (cm)	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
		Kw	Kf	T		
2srrn:						
Dalbo-----	0-18	.37	.37	3	6	48
	18-38	.55	.55			
	38-69	.37	.37			
	69-85	.37	.37			
	85-118	.43	.43			
	118-200	.37	.37			
Voyageurs-----	0-7	.37	.37	3	6	48
	7-17	.49	.49			
	17-30	.49	.49			
	30-70	.37	.37			
	70-140	.10	.24			
	140-200	---	---			
Foglake-----	0-18	---	---	5	6	48
	18-20	.37	.37			
	20-38	.49	.49			
	38-90	.37	.37			
	90-100	.43	.43			
	100-200	.49	.49			
Spooner, till/bedrock substratum-----	0-4	---	---	3	6	48
	4-14	.37	.37			
	14-35	.49	.49			
	35-70	.43	.43			
	70-107	.37	.64			
	107-200	---	---			
Bootleg-----	0-9	---	---	4	5	56
	9-15	.37	.37			
	15-27	.28	.28			
	27-57	.32	.32			
	57-137	.32	.32			
	137-200	.37	.37			
Hassman-----	0-19	.28	.28	5	6	48
	19-27	.37	.37			
	27-46	.43	.43			
	46-74	.43	.43			
	74-152	.43	.43			
	152-200	.43	.43			
2srrq:						
Cathro, ponded-----	0-14	---	---	1	8	0
	14-42	---	---			
	42-48	.37	.37			
	48-62	.37	.37			
	62-200	.37	.37			
Tacoosh, ponded-----	0-25	---	---	1	8	0
	25-125	---	---			
	125-135	.28	.28			
	135-200	.32	.32			
Sax, ponded-----	0-21	---	---	1	2	134
	21-31	.32	.32			
	31-93	.49	.49			
	93-200	.55	.55			

# Soil Survey of Voyageurs National Park, Minnesota

Table 18.—Erosion Properties—Continued

Map symbol and soil name	Depth (cm)	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
		Kw	Kf	T		
2srrq: Aquepts, stony, moderately slow Ksat---	0-18	.28	.28	5	5	56
	18-38	.37	.37			
	38-98	.49	.49			
	98-200	.28	.49			
2srrr: Insula, very stony, skeletal-----	0-10	---	---	1	6	48
	10-18	.10	.32			
	18-40	.15	.49			
	40-200	---	---			
Voyageurs-----	0-7	.37	.37	3	6	48
	7-17	.49	.49			
	17-30	.49	.49			
	30-70	.37	.37			
	70-140	.10	.24			
	140-200	---	---			
Wahlsten, very stony-----	0-9	.10	.32	2	7	38
	9-22	.15	.28			
	22-78	.17	.28			
	78-200	---	---			
Conic, very stony, skeletal-----	0-7	.10	.24	2	6	48
	7-14	.15	.43			
	14-26	.17	.55			
	26-62	.17	.55			
	62-200	---	---			
Spooner, till/bedrock substratum-----	0-4	---	---	3	6	48
	4-14	.37	.37			
	14-35	.49	.49			
	35-70	.43	.43			
	70-107	.37	.64			
	107-200	---	---			
Brickton-----	0-13	---	---	5	6	48
	13-20	.43	.43			
	20-38	.49	.49			
	38-125	.37	.37			
	125-155	.32	.32			
	155-200	.32	.32			
Dishno, very stony, skeletal-----	0-9	.05	.17	3	6	48
	9-18	.10	.32			
	18-37	.05	.20			
	37-53	.15	.24			
	53-114	.17	.28			
	114-125	.24	.37			
	125-200	---	---			
Aquepts, very rubbly-----	0-10	.05	.20	5	8	0
	10-28	.10	.43			
	28-102	.24	.49			
	102-200	.20	.37			
Aquepts, stony, moderately slow Ksat---	0-18	.28	.28	5	5	56
	18-38	.37	.37			
	38-98	.49	.49			
	98-200	.28	.49			
Rock outcrop.						

# Soil Survey of Voyageurs National Park, Minnesota

Table 18.—Erosion Properties—Continued

Map symbol and soil name	Depth (cm)	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
		Kw	Kf	T		
2srrt:						
Bowstring, frequently flooded-----	0-155	---	---	1	2	134
	155-156	.43	.43			
	156-185	---	---			
	185-200	.55	.55			
Fluvaquents, frequently flooded-----	0-15	---	---	5	5	56
	15-25	.32	.32			
	25-40	.43	.43			
	40-64	.32	.32			
	64-200	.17	.28			
Cathro, frequently flooded-----	0-14	---	---	1	5	56
	14-42	---	---			
	42-48	.37	.37			
	48-62	.37	.37			
	62-200	.37	.37			
W. Water						

# Soil Survey of Voyageurs National Park, Minnesota

Table 19.—Total Soil Carbon

(This table displays soil organic carbon (SOC) and soil inorganic carbon (SIC) in kilograms per square meter to a depth of 2 meters or to the representative top depth of any kind of bedrock or any cemented soil horizon. SOC and SIC are reported on a volumetric whole soil basis, corrected for representative rock fragments indicated in the database. SOC is converted from horizon soil organic matter of the fraction of the soil less than 2 mm in diameter. If soil organic matter indicated in the database is NULL, SOC is assumed to be zero. SIC is converted from horizon calcium carbonate content fraction of the soil less than 2 mm in diameter. If horizon calcium carbonate indicated in the database is NULL, SIC is assumed to be zero. A weighted average of all horizons is used in the calculations)

Map unit symbol, component name, and component percent	SOC	SIC
	kg/m <sup>2</sup>	kg/m <sup>2</sup>
2srmd:		
Quetico, bouldery (35%)-----	3	0
Insula, bouldery (20%)-----	6	0
Rock outcrop (15%)-----	0	0
Wahlsten, bouldery, skeletal (10%)-----	5	0
Conic, bouldery, skeletal (10%)-----	4	0
Arcadian, very stony (10%)-----	5	0
2srqm:		
Quetico, bouldery (40%)-----	3	0
Insula, bouldery (25%)-----	6	0
Rock outcrop (15%)-----	0	0
Conic, bouldery, skeletal (10%)-----	4	0
Arcadian, very stony (10%)-----	5	0
2srqn:		
Insula, very bouldery, skeletal (35%)-----	6	0
Conic, very bouldery, skeletal (16%)-----	4	0
Rock outcrop (15%)-----	0	0
Metonga, very stony, skeletal (14%)-----	9	0
Quetico, very bouldery, skeletal (10%)-----	2	0
Wahlsten, very stony (5%)-----	7	0
Voyageurs (3%)-----	8	0
Aquepts, very rubbly (2%)-----	7	0



# Soil Survey of Voyageurs National Park, Minnesota

Table 19.—Total Soil Carbon—Continued

Map unit symbol, component name, and component percent	SOC	SIC
	kg/m <sup>2</sup>	kg/m <sup>2</sup>
<b>2srqp:</b>		
Quetico, very bouldery, skeletal (31%)-----	2	0
Insula, very bouldery, skeletal (30%)-----	6	0
Greenwood (15%)-----	142	0
Rock outcrop (9%)-----	0	0
Merwin (5%)-----	40	0
Aquepts, very rubbly (5%)-----	7	0
Wahlsten, very stony (3%)-----	7	0
Conic, very bouldery, skeletal (2%)-----	4	0
<b>2srqr:</b>		
Greenwood (80%)-----	142	0
Merwin (10%)-----	40	0
Rifle, moat (5%)-----	102	0
Tacoosh, moat (5%)-----	92	0
<b>2srqs:</b>		
Insula, very stony, skeletal (30%)-----	6	0
Conic, very stony, skeletal (16%)-----	4	0
Wahlsten, very stony (15%)-----	7	0
Quetico, very stony, skeletal (10%)-----	2	0
Metonga, very stony, skeletal (9%)-----	9	0
Dishno, very stony, skeletal (9%)-----	10	0
Aquepts, very rubbly (3%)-----	7	0
Aquepts, stony, moderately slow Ksat (2%)-----	19	0
Voyageurs (2%)-----	8	0
Rock outcrop (2%)-----	0	0
Foglake (1%)-----	18	9
Eaglesnest, very stony (1%)-----	5	0
<b>2srqv:</b>		
Voyageurs, oxyaquic (35%)-----	9	0
Conic, very stony, skeletal (15%)-----	4	0
Littleswan (20%)-----	11	16
Insula, very stony, skeletal (10%)-----	6	0

# Soil Survey of Voyageurs National Park, Minnesota

Table 19.—Total Soil Carbon—Continued

Map unit symbol, component name, and component percent	SOC	SIC
	<u>kg/m<sup>2</sup></u>	<u>kg/m<sup>2</sup></u>
2srqv:		
Wahlsten, very stony (5%)-----	7	0
Metonga, very stony, skeletal (5%)-----	9	0
Baudette (5%)-----	9	22
Aquepts, stony, moderately slow Ksat (4%)-----	19	0
Rock outcrop (1%)-----	0	0
2srqw:		
Wahlsten, very stony (26%)-----	7	0
Spooner (24%)-----	17	14
Voyageurs (22%)-----	8	0
Insula, very stony, skeletal (10%)-----	6	0
Dishno, very stony, skeletal (9%)-----	10	0
Aquepts, stony, moderately slow Ksat (3%)-----	19	0
Littleswan (3%)-----	11	16
Aquepts, very rubbly (2%)-----	7	0
Rock outcrop (1%)-----	0	0
2srqy:		
Baudette (40%)-----	9	22
Littleswan (35%)-----	11	16
Voyageurs (10%)-----	8	0
Wahlsten, very stony (5%)-----	7	0
Insula, very stony, skeletal (5%)-----	6	0
Spooner (5%)-----	17	14
2srqz:		
Canthook (30%)-----	7	20
Durkeelake (30%)-----	8	10
Bootleg (10%)-----	17	11
Udipsamments (10%)-----	3	0
Grytal (10%)-----	7	0
Voyageurs (5%)-----	8	0
Aquepts, stony, moderately slow Ksat (5%)-----	19	0

# Soil Survey of Voyageurs National Park, Minnesota

Table 19.—Total Soil Carbon—Continued

Map unit symbol, component name, and component percent	SOC	SIC
	kg/m <sup>2</sup>	kg/m <sup>2</sup>
<b>2srr3:</b>		
Spooner (40%)-----	17	14
Sax (35%)-----	31	10
Spooner, till/bedrock substratum (5%)-----	14	0
Foglake (5%)-----	18	9
Littleswan (5%)-----	11	16
Bootleg (5%)-----	17	11
Canthook (5%)-----	7	20
<b>2srr4:</b>		
Littleswan (40%)-----	11	16
Spooner (25%)-----	17	14
Voyageurs (10%)-----	8	0
Spooner, till/bedrock substratum (5%)-----	14	0
Sax (5%)-----	31	10
Foglake (5%)-----	18	9
Bootleg (5%)-----	17	11
Canthook (5%)-----	7	20
<b>2srr7:</b>		
Mooselake (80%)-----	148	0
Tacoosh, moat (10%)-----	92	0
Rifle (5%)-----	139	0
Cathro, moat (5%)-----	44	0
<b>2srr8:</b>		
Rifle (80%)-----	140	0
Tacoosh, moat (10%)-----	92	0
Greenwood (5%)-----	142	0
Aquepts, stony, moderately slow Ksat (5%)-----	19	0
<b>2srr9:</b>		
Tacoosh, frequently flooded (40%)-----	92	0
Sax, frequently flooded (35%)-----	31	10
Cathro, frequently flooded (10%)-----	44	0
Rifle, frequently flooded (10%)-----	102	0
Hassman, frequently flooded (5%)-----	22	14

# Soil Survey of Voyageurs National Park, Minnesota

Table 19.—Total Soil Carbon—Continued

Map unit symbol, component name, and component percent	SOC	SIC
	kg/m <sup>2</sup>	kg/m <sup>2</sup>
<b>2srrb:</b>		
Aquents, ponded (30%)-----	8	0
Sax, ponded (25%)-----	31	10
Tacoosh, ponded (25%)-----	92	0
Rifle, ponded (10%)-----	102	0
Hassman, ponded (10%)-----	22	14
<b>2srrh:</b>		
Greenwood, seasonally ponded (80%)-----	142	0
Merwin, seasonally ponded (10%)-----	40	0
Rifle, seasonally ponded (5%)-----	139	0
Tacoosh, seasonally ponded (5%)-----	92	0
<b>2srrj:</b>		
Rifle, seasonally ponded (80%)-----	159	0
Tacoosh, seasonally ponded (10%)-----	92	0
Greenwood, seasonally ponded (5%)-----	142	0
Aquepts, stony, moderately slow Ksat (5%)-----	19	0
<b>2srrk:</b>		
Insula, very stony, skeletal (30%)-----	6	0
Conic, very stony, skeletal (16%)-----	4	0
Wahlsten, very stony (15%)-----	7	0
Quetico, very stony, skeletal (10%)-----	2	0
Metonga, very stony, skeletal (9%)-----	9	0
Dishno, very stony, skeletal (9%)-----	10	0
Aquepts, very rubbly (3%)-----	7	0
Aquepts, stony, moderately slow Ksat (2%)-----	19	0
Voyageurs (2%)-----	8	0
Rock outcrop (2%)-----	0	0
Foglake (1%)-----	18	9
Eaglesnest, very stony (1%)-----	5	0

# Soil Survey of Voyageurs National Park, Minnesota

Table 19.—Total Soil Carbon—Continued

Map unit symbol, component name, and component percent	SOC	SIC
	kg/m <sup>2</sup>	kg/m <sup>2</sup>
<b>2srrl:</b>		
Tacoosh, occasionally flooded (40%)-----	92	0
Sax, occasionally flooded (35%)-----	31	10
Cathro, occasionally flooded (10%)-----	44	0
Rifle, occasionally flooded (10%)-----	102	0
Hassman, occasionally flooded (5%)-----	22	14
<b>2srrm:</b>		
Brickton (40%)-----	19	9
Hassman (35%)-----	22	14
Spooner, till/bedrock substratum (5%)-----	14	0
Foglake (5%)-----	18	9
Dalbo (5%)-----	10	13
Bootleg (5%)-----	17	11
Tacoosh (5%)-----	92	0
<b>2srrn:</b>		
Brickton (60%)-----	19	9
Dalbo (15%)-----	10	13
Voyageurs (5%)-----	8	0
Foglake (5%)-----	18	9
Spooner, till/bedrock substratum (5%)-----	14	0
Bootleg (5%)-----	17	11
Hassman (5%)-----	22	14
<b>2srrq:</b>		
Cathro, ponded (60%)-----	44	0
Tacoosh, ponded (30%)-----	92	0
Sax, ponded (5%)-----	31	10
Aquepts, stony, moderately slow Ksat (5%)-----	19	0

# Soil Survey of Voyageurs National Park, Minnesota

Table 19.—Total Soil Carbon—Continued

Map unit symbol, component name, and component percent	SOC	SIC
	kg/m <sup>2</sup>	kg/m <sup>2</sup>
<b>2srrr:</b>		
Insula, very stony, skeletal (30%)-----	6	0
Voyageurs (20%)-----	8	0
Wahlsten, very stony (15%)-----	7	0
Conic, very stony, skeletal (10%)-----	4	0
Spooner, till/bedrock substratum (8%)-----	14	0
Brickton (5%)-----	19	9
Dishno, very stony, skeletal (5%)-----	10	0
Aquepts, very rubbly (3%)-----	7	0
Aquepts, stony, moderately slow Ksat (2%)-----	19	0
Rock outcrop (2%)-----	0	0
<b>2srtr:</b>		
Bowstring, frequently flooded (50%)-----	174	0
Fluvaquents, frequently flooded (40%)-----	40	0
Cathro, frequently flooded (10%)-----	44	0
<b>W:</b>		
Water (100%)-----	0	0

Table 20.--Soil Features

(See text for definitions of terms used in this table. Absence of an entry indicates that data were not populated)

Map symbol and soil name	Restrictive layer				Potential for frost action	Risk of corrosion	
	Kind	Depth to top Cm	Thickness Cm	Hardness		Uncoated steel	Concrete
2srmd:							
Quetico, bouldery-----	Lithic bedrock	10-25	175-190	Indurated	Moderate	Moderate	High
Insula, bouldery-----	Lithic bedrock	25-50	150-175	Indurated	Moderate	Moderate	High
Rock outcrop-----	Lithic bedrock	0-0	200-200	Indurated	---	---	---
Wahlsten, bouldery, skeletal-----	Lithic bedrock	51-102	98-149	Indurated	Moderate	Moderate	High
Conic, bouldery, skeletal-----	Lithic bedrock	50-75	125-150	Indurated	Moderate	Moderate	High
Arcadian, very stony-----	Lithic bedrock	25-51	149-175	Indurated	Moderate	High	High
2srqm:							
Quetico, bouldery-----	Lithic bedrock	10-25	175-190	Indurated	Moderate	Moderate	High
Insula, bouldery-----	Lithic bedrock	25-50	150-175	Indurated	Moderate	Moderate	High
Rock outcrop-----	Lithic bedrock	0-0	200-200	Indurated	---	---	---
Conic, bouldery, skeletal-----	Lithic bedrock	50-75	125-150	Indurated	Moderate	Moderate	High
Arcadian, very stony-----	Lithic bedrock	25-51	149-175	Indurated	Moderate	High	High
2srqn:							
Insula, very bouldery, skeletal--	Lithic bedrock	25-51	149-175	Indurated	Moderate	Moderate	High
Conic, very bouldery, skeletal---	Lithic bedrock	51-102	98-149	Indurated	Moderate	High	High
Rock outcrop-----	Lithic bedrock	0-0	200-200	Indurated	---	---	---
Metonga, very stony, skeletal----	Lithic bedrock	50-100	100-150	Indurated	Moderate	High	High
Quetico, very bouldery, skeletal-	Lithic bedrock	10-25	175-190	Indurated	Moderate	Moderate	High
Wahlsten, very stony-----	Lithic bedrock	51-102	98-149	Indurated	Moderate	High	High
Voyageurs-----	Lithic bedrock	120-160	40-80	Indurated	Moderate	High	Moderate
Aquepts, very rubbly-----	No restriction	---	---	---	High	High	Moderate



Table 20.--Soil Features--Continued

Map symbol and soil name	Restrictive layer				Potential for frost action	Risk of corrosion	
	Kind	Depth to top Cm	Thickness Cm	Hardness		Uncoated steel	Concrete
2srqp:							
Quetico, very bouldery, skeletal-	Lithic bedrock	10-25	175-190	Indurated	Moderate	Moderate	High
Insula, very bouldery, skeletal--	Lithic bedrock	25-51	149-175	Indurated	Moderate	Moderate	High
Greenwood-----	No restriction	---	---	---	High	High	High
Rock outcrop-----	Lithic bedrock	0-0	200-200	Indurated	---	---	---
Merwin-----	No restriction	---	---	---	High	High	High
Aquepts, very rubbly-----	No restriction	---	---	---	High	High	Moderate
Wahlsten, very stony-----	Lithic bedrock	51-102	98-149	Indurated	Moderate	High	High
Conic, very bouldery, skeletal---	Lithic bedrock	51-102	98-149	Indurated	Moderate	High	High
2srqr:							
Greenwood-----	No restriction	---	---	---	High	High	High
Merwin-----	No restriction	---	---	---	High	High	High
Rifle, moat-----	No restriction	---	---	---	High	High	High
Tacoosh, moat-----	No restriction	---	---	---	High	High	High
2srqs:							
Insula, very stony, skeletal-----	Lithic bedrock	25-51	149-175	Indurated	Moderate	Moderate	High
Conic, very stony, skeletal-----	Lithic bedrock	51-102	98-149	Indurated	Moderate	High	High
Wahlsten, very stony-----	Lithic bedrock	51-102	98-149	Indurated	Moderate	High	High
Quetico, very stony, skeletal----	Lithic bedrock	10-25	175-190	Indurated	Moderate	Moderate	High
Metonga, very stony, skeletal----	Lithic bedrock	50-100	100-150	Indurated	Moderate	High	High
Dishno, very stony, skeletal-----	Lithic bedrock	50-150	50-150	Indurated	Moderate	High	High
Aquepts, very rubbly-----	No restriction	---	---	---	High	High	Moderate
Aquepts, stony, moderately slow Ksat-----	No restriction	---	---	---	High	High	Moderate
Voyageurs-----	Lithic bedrock	120-160	40-80	Indurated	Moderate	High	Moderate
Rock outcrop-----	Lithic bedrock	0-0	200-200	Indurated	---	---	---

Table 20.—Soil Features—Continued

Map symbol and soil name	Restrictive layer				Potential for frost action	Risk of corrosion	
	Kind	Depth to top Cm	Thickness Cm	Hardness		Uncoated steel	Concrete
2srqs:							
Foglake-----	No restriction	---	---	---	High	High	High
Eaglesnest, very stony-----	Densic material	100-150	50-100	Noncemented	Moderate	High	High
2srqv:							
Voyageurs, oxyaquic-----	Lithic bedrock	100-160	40-100	Indurated	High	High	Moderate
Conic, very stony, skeletal-----	Lithic bedrock	51-102	98-149	Indurated	Moderate	High	High
Little Swan-----	No restriction	---	---	---	High	High	Moderate
Insula, very stony, skeletal-----	Lithic bedrock	25-51	149-175	Indurated	Moderate	Moderate	High
Wahlsten, very stony-----	Lithic bedrock	51-102	98-149	Indurated	Moderate	High	High
Metonga, very stony, skeletal-----	Lithic bedrock	50-100	100-150	Indurated	Moderate	High	High
Baudette-----	No restriction	---	---	---	High	High	Moderate
Aquepts, stony, moderately slow Ksat-----	No restriction	---	---	---	High	High	Moderate
Rock outcrop-----	Lithic bedrock	0-0	200-200	Indurated	---	---	---
2srqw:							
Wahlsten, very stony-----	Lithic bedrock	51-102	98-149	Indurated	Moderate	High	High
Spooner-----	No restriction	---	---	---	High	High	Moderate
Voyageurs-----	Lithic bedrock	120-160	40-80	Indurated	Moderate	High	Moderate
Insula, very stony, skeletal-----	Lithic bedrock	25-51	149-175	Indurated	Moderate	Moderate	High
Dishno, very stony, skeletal-----	Lithic bedrock	50-150	50-150	Indurated	Moderate	High	High
Aquepts, stony, moderately slow Ksat-----	No restriction	---	---	---	High	High	Moderate
Little Swan-----	No restriction	---	---	---	High	High	Moderate
Aquepts, very rubbly-----	No restriction	---	---	---	High	High	Moderate
Rock outcrop-----	Lithic bedrock	0-0	200-200	Indurated	---	---	---

Table 20.—Soil Features—Continued

Map symbol and soil name	Restrictive layer				Potential for frost action	Risk of corrosion	
	Kind	Depth to top <u>Cm</u>	Thickness <u>Cm</u>	Hardness		Uncoated steel	Concrete
2srqy:							
Baudette-----	No restriction	---	---	---	High	High	Moderate
Little Swan-----	No restriction	---	---	---	High	High	Moderate
Voyageurs-----	Lithic bedrock	120-160	40-80	Indurated	Moderate	High	Moderate
Wahlsten, very stony-----	Lithic bedrock	51-102	98-149	Indurated	Moderate	High	High
Insula, very stony, skeletal-----	Lithic bedrock	25-51	149-175	Indurated	Moderate	Moderate	High
Spooner-----	No restriction	---	---	---	High	High	Moderate
2srqz:							
Canthook-----	No restriction	---	---	---	High	High	Moderate
Durkeelake-----	No restriction	---	---	---	Moderate	High	High
Bootleg-----	No restriction	---	---	---	High	High	High
Udipsamments-----	No restriction	---	---	---	Low	Low	High
Grytal-----	No restriction	---	---	---	Low	Low	High
Voyageurs-----	Lithic bedrock	120-160	40-80	Indurated	Moderate	High	Moderate
Aquepts, stony, moderately slow Ksat-----	No restriction	---	---	---	High	High	Moderate
2srr3:							
Spooner-----	No restriction	---	---	---	High	High	Moderate
Sax-----	No restriction	---	---	---	High	High	Moderate
Spooner, till/bedrock substratum	Lithic bedrock	102-190	10-98	Indurated	High	High	High
Foglake-----	No restriction	---	---	---	High	High	High
Little Swan-----	No restriction	---	---	---	High	High	Moderate
Bootleg-----	No restriction	---	---	---	High	High	High
Canthook-----	No restriction	---	---	---	High	High	Moderate

Table 20.--Soil Features--Continued

Map symbol and soil name	Restrictive layer				Potential for frost action	Risk of corrosion	
	Kind	Depth to top Cm	Thickness Cm	Hardness		Uncoated steel	Concrete
2srr4:							
Little Swan-----	No restriction	---	---	---	High	High	Moderate
Spooner-----	No restriction	---	---	---	High	High	Moderate
Voyageurs-----	Lithic bedrock	120-160	40-80	Indurated	Moderate	High	Moderate
Spooner, till/bedrock substratum	Lithic bedrock	102-190	10-98	Indurated	High	High	High
Sax-----	No restriction	---	---	---	High	High	Moderate
Fog Lake-----	No restriction	---	---	---	High	High	High
Bootleg-----	No restriction	---	---	---	High	High	High
Canthook-----	No restriction	---	---	---	High	High	Moderate
2srr7:							
Mooselake-----	No restriction	---	---	---	High	High	Moderate
Tacoosh, moat-----	No restriction	---	---	---	High	High	High
Rifle-----	No restriction	---	---	---	High	High	High
Cathro, moat-----	No restriction	---	---	---	High	High	High
2srr8:							
Rifle-----	No restriction	---	---	---	High	High	High
Tacoosh, moat-----	No restriction	---	---	---	High	High	High
Greenwood-----	No restriction	---	---	---	High	High	High
Aquepts, stony, moderately slow Ksat-----	No restriction	---	---	---	High	High	Moderate
2srr9:							
Tacoosh, frequently flooded-----	No restriction	---	---	---	High	High	High
Sax, frequently flooded-----	No restriction	---	---	---	High	High	Moderate
Cathro, frequently flooded-----	No restriction	---	---	---	High	High	High
Rifle, frequently flooded-----	No restriction	---	---	---	High	High	High
Hassman, frequently flooded-----	No restriction	---	---	---	High	Moderate	Moderate

Table 20.--Soil Features--Continued

Map symbol and soil name	Restrictive layer				Potential for frost action	Risk of corrosion	
	Kind	Depth to top <u>Cm</u>	Thickness <u>Cm</u>	Hardness		Uncoated steel	Concrete
2srrb:							
Aquents, ponded-----	No restriction	---	---	---	High	High	Moderate
Sax, ponded-----	No restriction	---	---	---	High	High	Moderate
Tacoosh, ponded-----	No restriction	---	---	---	High	High	High
Rifle, ponded-----	No restriction	---	---	---	High	High	High
Hassman, ponded-----	No restriction	---	---	---	High	High	Moderate
2srrh:							
Greenwood, seasonally ponded-----	No restriction	---	---	---	High	High	High
Merwin, seasonally ponded-----	No restriction	---	---	---	High	High	High
Rifle, seasonally ponded-----	No restriction	---	---	---	High	High	High
Tacoosh, seasonally ponded-----	No restriction	---	---	---	High	High	High
2srrj:							
Rifle, seasonally ponded-----	No restriction	---	---	---	High	High	High
Tacoosh, seasonally ponded-----	No restriction	---	---	---	High	High	High
Greenwood, seasonally ponded-----	No restriction	---	---	---	High	High	High
Aquepts, stony, moderately slow Ksat-----	No restriction	---	---	---	High	High	Moderate
2srrk:							
Insula, very stony, skeletal-----	Lithic bedrock	25-51	149-175	Indurated	Moderate	Moderate	High
Conic, very stony, skeletal-----	Lithic bedrock	51-102	98-149	Indurated	Moderate	High	High
Wahlsten, very stony-----	Lithic bedrock	51-102	98-149	Indurated	Moderate	High	High
Quetico, very stony, skeletal----	Lithic bedrock	10-25	175-190	Indurated	Moderate	Moderate	High
Metonga, very stony, skeletal----	Lithic bedrock	50-100	100-150	Indurated	Moderate	High	High
Dishno, very stony, skeletal-----	Lithic bedrock	50-150	50-150	Indurated	Moderate	High	High
Aquepts, very rubbly-----	No restriction	---	---	---	High	High	Moderate
Aquepts, stony, moderately slow Ksat-----	No restriction	---	---	---	High	High	Moderate

Table 20.—Soil Features—Continued

Map symbol and soil name	Restrictive layer				Potential for frost action	Risk of corrosion	
	Kind	Depth to top Cm	Thickness Cm	Hardness		Uncoated steel	Concrete
2srrk:							
Voyageurs-----	Lithic bedrock	120-160	40-80	Indurated	Moderate	High	Moderate
Rock outcrop-----	Lithic bedrock	0-0	200-200	Indurated	---	---	---
Foglake-----	No restriction	---	---	---	High	High	High
Eaglesnest, very stony-----	Densic material	100-152	50-100	Noncemented	Moderate	Moderate	High
2srrl:							
Tacoosh, occasionally flooded----	No restriction	---	---	---	High	High	High
Sax, occasionally flooded-----	No restriction	---	---	---	High	High	Moderate
Cathro, occasionally flooded----	No restriction	---	---	---	High	High	High
Rifle, occasionally flooded-----	No restriction	---	---	---	High	High	High
Hassman, occasionally flooded----	No restriction	---	---	---	High	Moderate	Moderate
2srrm:							
Brickton-----	No restriction	---	---	---	High	High	High
Hassman-----	No restriction	---	---	---	High	High	Moderate
Spooner, till/bedrock substratum	Lithic bedrock	102-190	10-98	Indurated	High	High	High
Foglake-----	No restriction	---	---	---	High	High	High
Dalbo-----	No restriction	---	---	---	High	High	Moderate
Bootleg-----	No restriction	---	---	---	High	High	High
Tacoosh-----	No restriction	---	---	---	High	High	High
2srrn:							
Brickton-----	No restriction	---	---	---	High	High	High
Dalbo-----	No restriction	---	---	---	High	High	Moderate
Voyageurs-----	Lithic bedrock	120-160	40-80	Indurated	Moderate	High	Moderate
Foglake-----	No restriction	---	---	---	High	High	High
Spooner, till/bedrock substratum	Lithic bedrock	102-190	10-98	Indurated	High	High	High
Bootleg-----	No restriction	---	---	---	High	High	High
Hassman-----	No restriction	---	---	---	High	High	Moderate

Table 20.--Soil Features--Continued

Map symbol and soil name	Restrictive layer				Potential for frost action	Risk of corrosion	
	Kind	Depth to top Cm	Thickness Cm	Hardness		Uncoated steel	Concrete
2srrq:							
Cathro, ponded-----	No restriction	---	---	---	High	High	High
Tacoosh, ponded-----	No restriction	---	---	---	High	High	High
Sax, ponded-----	No restriction	---	---	---	High	High	Moderate
Aquepts, stony, moderately slow Ksat-----	No restriction	---	---	---	High	High	Moderate
2srrr:							
Insula, very stony, skeletal-----	Lithic bedrock	25-51	149-175	Indurated	Moderate	Moderate	High
Voyageurs-----	Lithic bedrock	120-160	40-80	Indurated	Moderate	High	Moderate
Wahlsten, very stony-----	Lithic bedrock	51-102	98-149	Indurated	Moderate	High	High
Conic, very stony, skeletal-----	Lithic bedrock	51-102	98-149	Indurated	Moderate	High	High
Spooner, till/bedrock substratum	Lithic bedrock	102-190	10-98	Indurated	High	High	High
Brickton-----	No restriction	---	---	---	High	High	High
Dishno, very stony, skeletal-----	Lithic bedrock	50-150	50-150	Indurated	Moderate	High	High
Aquepts, very rubbly-----	No restriction	---	---	---	High	High	Moderate
Aquepts, stony, moderately slow Ksat-----	No restriction	---	---	---	High	High	Moderate
Rock outcrop-----	Lithic bedrock	0-0	200-200	Indurated	---	---	---
2srtr:							
Bowstring, frequently flooded----	No restriction	---	---	---	High	High	Moderate
Fluvaquents, frequently flooded--	No restriction	---	---	---	High	Moderate	High
Cathro, frequently flooded-----	No restriction	---	---	---	High	High	High
W. Water							



Table 21.-Water Features

(See text for definitions of terms used in this table. Estimates of the frequency of ponding and flooding apply to the whole year rather than to individual months. Absence of an entry indicates that the feature is not a concern or that data were not estimated. Depths to water table are based on a representative value)

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			<u>m</u>	<u>m</u>	<u>m</u>				
2srmd: Quetico, bouldery-----	D	Jan-Dec	---	---	---	---	None	---	None
Insula, bouldery-----	D	Jan-Dec	---	---	---	---	None	---	None
Rock outcrop.									
Wahlsten, bouldery, skeletal----	B	April	0.6	0.9	---	---	None	---	None
		May	0.8	0.9	---	---	None	---	None
		June	0.8	0.9	---	---	None	---	None
		October	0.8	0.9	---	---	None	---	None
		November	0.6	0.9	---	---	None	---	None
Conic, bouldery, skeletal-----	B	Jan-Dec	---	---	---	---	None	---	None
Arcadian, very stony-----	D	Jan-Dec	---	---	---	---	None	---	None
2srqm: Quetico, bouldery-----	D	Jan-Dec	---	---	---	---	None	---	None
Insula, bouldery-----	D	Jan-Dec	---	---	---	---	None	---	None
Rock outcrop.									
Conic, bouldery, skeletal-----	B	Jan-Dec	---	---	---	---	None	---	None
Arcadian, very stony-----	D	Jan-Dec	---	---	---	---	None	---	None
2srqn: Insula, very bouldery, skeletal	D	Jan-Dec	---	---	---	---	None	---	None

Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			<u>m</u>	<u>m</u>	<u>m</u>				
2srqn: Conic, very bouldery, skeletal-- Rock outcrop.	B	Jan-Dec	---	---	---	---	None	---	None
Metonga, very stony, skeletal---	B	Jan-Dec	---	---	---	---	None	---	None
Quetico, very bouldery, skeletal	D	Jan-Dec	---	---	---	---	None	---	None
Wahlsten, very stony-----	C	April May June October November	0.6 0.8 0.8 0.8 0.6	0.8 0.8 0.8 0.8 0.8	--- --- --- --- ---	--- --- --- --- ---	None None None None None	--- --- --- --- ---	None None None None None
Voyageurs-----	C/D	January February March April May June July September October November December	1.2 1.3 0.8 0.2 0.2 0.6 0.8 0.8 0.6 0.3 0.8	1.4 1.4 1.4 1.4 1.4 1.4 1.4 1.4 1.4 1.4 1.4	--- --- --- --- --- --- --- --- --- --- ---	--- --- --- --- --- --- --- --- --- --- ---	None None None None None None None None None None None	--- --- --- --- --- --- --- --- --- --- ---	None None None None None None None None None None None
Aquepts, very rubbly-----	B/D	January February March April May June July August September October November December	0.5 0.6 0.2 0.0 0.0 0.0 0.1 0.3 0.4 0.1 0.0 0.2	>2.0 >2.0 >2.0 >2.0 >2.0 >2.0 >2.0 >2.0 >2.0 >2.0 >2.0 >2.0	--- --- --- 0.1-0.2 0.1-0.2 --- --- --- --- --- --- ---	--- --- --- Long (7 to 30 days) Long (7 to 30 days) --- --- --- --- --- ---	--- --- --- Frequent Frequent --- --- --- --- --- --- --- ---	--- --- --- --- --- --- --- --- --- --- --- ---	None None None None None None None None None None None None

Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srqp: Quetico, very bouldery, skeletal	D	Jan-Dec	---	---	---	---	None	---	None
Insula, very bouldery, skeletal	D	Jan-Dec	---	---	---	---	None	---	None
Greenwood-----	A/D	January	0.4	>2.0	---	---	None	---	None
		February	0.5	>2.0	---	---	None	---	None
		March	0.4	>2.0	---	---	None	---	None
		April	0.2	>2.0	---	---	None	---	None
		May	0.2	>2.0	---	---	None	---	None
		June	0.2	>2.0	---	---	None	---	None
		July	0.2	>2.0	---	---	None	---	None
		August	0.3	>2.0	---	---	None	---	None
		September	0.3	>2.0	---	---	None	---	None
		October	0.2	>2.0	---	---	None	---	None
		November	0.2	>2.0	---	---	None	---	None
		December	0.3	>2.0	---	---	None	---	None
Rock outcrop.									
Merwin-----	C/D	January	0.3	>2.0	---	---	---	---	None
		February	0.3	>2.0	---	---	---	---	None
		March	0.2	>2.0	---	---	---	---	None
		April	0.0	>2.0	0.1-0.2	Long (7 to 30 days)	Occasional	---	None
		May	0.0	>2.0	---	---	---	---	None
		June	0.0	>2.0	---	---	---	---	None
		July	0.2	>2.0	---	---	---	---	None
		August	0.3	>2.0	---	---	---	---	None
		September	0.2	>2.0	---	---	---	---	None
		October	0.0	>2.0	---	---	---	---	None
		November	0.0	>2.0	---	---	---	---	None
		December	0.2	>2.0	---	---	---	---	None

Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srqp: Aquepts, very rubbly-----	B/D	January	0.5	>2.0	---	---	---	---	None
		February	0.6	>2.0	---	---	---	---	None
		March	0.2	>2.0	---	---	---	---	None
		April	0.0	>2.0	0.1-0.2	Long (7 to 30 days)	Frequent	---	None
		May	0.0	>2.0	0.1-0.2	Long (7 to 30 days)	Frequent	---	None
		June	0.0	>2.0	---	---	---	---	None
		July	0.1	>2.0	---	---	---	---	None
		August	0.3	>2.0	---	---	---	---	None
		September	0.4	>2.0	---	---	---	---	None
		October	0.1	>2.0	---	---	---	---	None
		November	0.0	>2.0	---	---	---	---	None
		December	0.2	>2.0	---	---	---	---	None
Wahlsten, very stony-----	C	April	0.6	0.8	---	---	None	---	None
		May	0.8	0.8	---	---	None	---	None
		June	0.8	0.8	---	---	None	---	None
		October	0.8	0.8	---	---	None	---	None
		November	0.6	0.8	---	---	None	---	None
Conic, very bouldery, skeletal--	B	Jan-Dec	---	---	---	---	None	---	None
2srqr: Greenwood-----	A/D	January	0.4	>2.0	---	---	None	---	None
		February	0.5	>2.0	---	---	None	---	None
		March	0.4	>2.0	---	---	None	---	None
		April	0.1	>2.0	---	---	None	---	None
		May	0.1	>2.0	---	---	None	---	None
		June	0.2	>2.0	---	---	None	---	None
		July	0.2	>2.0	---	---	None	---	None
		August	0.3	>2.0	---	---	None	---	None
		September	0.3	>2.0	---	---	None	---	None
		October	0.2	>2.0	---	---	None	---	None
		November	0.2	>2.0	---	---	None	---	None
		December	0.3	>2.0	---	---	None	---	None

Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srqr: Merwin-----	C/D	January	0.3	>2.0	---	---	---	---	None
		February	0.3	>2.0	---	---	---	---	None
		March	0.2	>2.0	---	---	---	---	None
		April	0.0	>2.0	0.1-0.2	Long (7 to 30 days)	Occasional	---	None
		May	0.0	>2.0	---	---	---	---	None
		June	0.0	>2.0	---	---	---	---	None
		July	0.2	>2.0	---	---	---	---	None
		August	0.3	>2.0	---	---	---	---	None
		September	0.2	>2.0	---	---	---	---	None
		October	0.0	>2.0	---	---	---	---	None
		November	0.0	>2.0	---	---	---	---	None
		December	0.2	>2.0	---	---	---	---	None
Rifle, moat-----	A/D	January	0.3	>2.0	---	---	---	---	None
		February	0.4	>2.0	---	---	---	---	None
		March	0.3	>2.0	---	---	---	---	None
		April	0.0	>2.0	0.1-0.2	Long (7 to 30 days)	Frequent	---	None
		May	0.0	>2.0	0.0-0.2	Long (7 to 30 days)	Frequent	---	None
		June	0.1	>2.0	---	---	---	---	None
		July	0.1	>2.0	---	---	---	---	None
		August	0.2	>2.0	---	---	---	---	None
		September	0.2	>2.0	---	---	---	---	None
		October	0.1	>2.0	---	---	---	---	None
		November	0.1	>2.0	---	---	---	---	None
		December	0.2	>2.0	---	---	---	---	None

Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srqr: Tacoosh, moat-----	A/D	January	0.3	>2.0	---	---	---	---	None
		February	0.4	>2.0	---	---	---	---	None
		March	0.3	>2.0	---	---	---	---	None
		April	0.0	>2.0	0.1-0.2	Long (7 to 30 days)	Frequent	---	None
		May	0.0	>2.0	0.0-0.2	Long (7 to 30 days)	Frequent	---	None
		June	0.1	>2.0	---	---	---	---	None
		July	0.1	>2.0	---	---	---	---	None
		August	0.2	>2.0	---	---	---	---	None
		September	0.2	>2.0	---	---	---	---	None
		October	0.1	>2.0	---	---	---	---	None
		November	0.1	>2.0	---	---	---	---	None
		December	0.2	>2.0	---	---	---	---	None
2srqs: Insula, very stony, skeletal----	D	Jan-Dec	---	---	---	---	None	---	None
Conic, very stony, skeletal----	B	Jan-Dec	---	---	---	---	None	---	None
Wahlsten, very stony-----	C	April	0.6	0.8	---	---	None	---	None
		May	0.8	0.8	---	---	None	---	None
		June	0.8	0.8	---	---	None	---	None
		October	0.8	0.8	---	---	None	---	None
		November	0.6	0.8	---	---	None	---	None
Quetico, very stony, skeletal---	D	Jan-Dec	---	---	---	---	None	---	None
Metonga, very stony, skeletal---	B	Jan-Dec	---	---	---	---	None	---	None
Dishno, very stony, skeletal----	B	April	0.6	1.3	---	---	None	---	None
		May	0.8	1.3	---	---	None	---	None
		June	0.8	1.3	---	---	None	---	None
		October	0.8	1.3	---	---	None	---	None
		November	0.6	1.3	---	---	None	---	None

Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srqs: Aquepts, very rubbly-----	B/D	January	0.5	>2.0	---	---	---	---	None
		February	0.6	>2.0	---	---	---	---	None
		March	0.2	>2.0	---	---	---	---	None
		April	0.0	>2.0	0.1-0.2	Long (7 to 30 days)	Frequent	---	None
		May	0.0	>2.0	0.1-0.2	Long (7 to 30 days)	Frequent	---	None
		June	0.0	>2.0	---	---	---	---	None
		July	0.1	>2.0	---	---	---	---	None
		August	0.3	>2.0	---	---	---	---	None
		September	0.4	>2.0	---	---	---	---	None
		October	0.1	>2.0	---	---	---	---	None
		November	0.0	>2.0	---	---	---	---	None
		December	0.2	>2.0	---	---	---	---	None
Aquepts, stony, moderately slow Ksat-----	C/D	January	0.3	>2.0	---	---	---	---	None
		February	0.5	>2.0	---	---	---	---	None
		March	0.2	>2.0	---	---	---	---	None
		April	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		May	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		June	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		July	0.2	>2.0	---	---	---	---	None
		August	0.3	>2.0	---	---	---	---	None
		September	0.5	>2.0	---	---	---	---	None
		October	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		November	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		December	0.2	>2.0	---	---	---	---	None



Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srqs: Voyageurs-----	C/D	January	1.2	1.4	---	---	None	---	None
		February	1.3	1.4	---	---	None	---	None
		March	0.8	1.4	---	---	None	---	None
		April	0.2	1.4	---	---	None	---	None
		May	0.2	1.4	---	---	None	---	None
		June	0.6	1.4	---	---	None	---	None
		July	0.8	1.4	---	---	None	---	None
		September	0.8	1.4	---	---	None	---	None
		October	0.6	1.4	---	---	None	---	None
		November	0.3	1.4	---	---	None	---	None
		December	0.8	1.4	---	---	None	---	None
Rock outcrop.									
Foglake-----	C/D	January	1.2	>2.0	---	---	None	---	None
		February	1.2	>2.0	---	---	None	---	None
		March	0.6	>2.0	---	---	None	---	None
		April	0.2	>2.0	---	---	None	---	None
		May	0.2	>2.0	---	---	None	---	None
		June	0.3	>2.0	---	---	None	---	None
		July	0.5	>2.0	---	---	None	---	None
		August	0.6	>2.0	---	---	None	---	None
		September	0.6	>2.0	---	---	None	---	None
		October	0.5	>2.0	---	---	None	---	None
		November	0.3	>2.0	---	---	None	---	None
		December	0.6	>2.0	---	---	None	---	None
Eaglesnest, very stony-----	C	April	0.6	1.2	---	---	None	---	None
		May	0.8	1.3	---	---	None	---	None
		June	0.9	1.3	---	---	None	---	None
		October	0.9	1.3	---	---	None	---	None
		November	0.9	1.3	---	---	None	---	None
		December	1.1	1.3	---	---	None	---	None

Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srqv: Voyageurs, oxyaquic-----	C	March	1.3	1.4	---	---	None	---	None
		April	0.8	1.4	---	---	None	---	None
		May	0.8	1.4	---	---	None	---	None
		June	0.9	1.4	---	---	None	---	None
		July	1.3	1.4	---	---	None	---	None
		September	1.3	1.4	---	---	None	---	None
		October	1.1	1.4	---	---	None	---	None
		November	0.9	1.4	---	---	None	---	None
		December	1.3	1.4	---	---	None	---	None
Conic, very stony, skeletal----	B	Jan-Dec	---	---	---	---	None	---	None
Little Swan-----									
	C/D	January	1.5	>2.0	---	---	None	---	None
		February	1.5	>2.0	---	---	None	---	None
		March	0.9	>2.0	---	---	None	---	None
		April	0.5	>2.0	---	---	None	---	None
		May	0.5	>2.0	---	---	None	---	None
		June	0.6	>2.0	---	---	None	---	None
		July	0.8	>2.0	---	---	None	---	None
		August	0.9	>2.0	---	---	None	---	None
		September	0.9	>2.0	---	---	None	---	None
		October	0.8	>2.0	---	---	None	---	None
		November	0.6	>2.0	---	---	None	---	None
		December	0.9	>2.0	---	---	None	---	None
Insula, very stony, skeletal----	D	Jan-Dec	---	---	---	---	None	---	None
Wahlsten, very stony-----									
	C	April	0.6	0.8	---	---	None	---	None
		May	0.8	0.8	---	---	None	---	None
		June	0.8	0.8	---	---	None	---	None
		October	0.8	0.8	---	---	None	---	None
		November	0.6	0.8	---	---	None	---	None
Metonga, very stony, skeletal---	B	Jan-Dec	---	---	---	---	None	---	None

Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srqv: Baudette-----	C	March	1.4	>2.0	---	---	None	---	None
		April	0.8	>2.0	---	---	None	---	None
		May	0.8	>2.0	---	---	None	---	None
		June	0.9	>2.0	---	---	None	---	None
		July	1.2	>2.0	---	---	None	---	None
		August	1.5	>2.0	---	---	None	---	None
		September	1.5	>2.0	---	---	None	---	None
		October	1.1	>2.0	---	---	None	---	None
		November	0.9	>2.0	---	---	None	---	None
		December	1.4	>2.0	---	---	None	---	None
Aquepts, stony, moderately slow Ksat-----	C/D	January	0.3	>2.0	---	---	---	---	None
		February	0.5	>2.0	---	---	---	---	None
		March	0.2	>2.0	---	---	---	---	None
		April	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		May	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		June	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		July	0.2	>2.0	---	---	---	---	None
		August	0.3	>2.0	---	---	---	---	None
		September	0.5	>2.0	---	---	---	---	None
		October	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		November	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		December	0.2	>2.0	---	---	---	---	None
Rock outcrop.									
2srqw: Wahlsten, very stony-----	C	April	0.6	0.8	---	---	None	---	None
		May	0.8	0.8	---	---	None	---	None
		June	0.8	0.8	---	---	None	---	None
		October	0.8	0.8	---	---	None	---	None
		November	0.6	0.8	---	---	None	---	None

Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srqw: Spoonerville-----	C/D	January	1.2	>2.0	---	---	None	---	None
		February	1.2	>2.0	---	---	None	---	None
		March	0.6	>2.0	---	---	None	---	None
		April	0.2	>2.0	---	---	None	---	None
		May	0.2	>2.0	---	---	None	---	None
		June	0.3	>2.0	---	---	None	---	None
		July	0.5	>2.0	---	---	None	---	None
		August	0.6	>2.0	---	---	None	---	None
		September	0.6	>2.0	---	---	None	---	None
		October	0.5	>2.0	---	---	None	---	None
		November	0.3	>2.0	---	---	None	---	None
		December	0.6	>2.0	---	---	None	---	None
Voyageurs-----	C/D	January	1.2	1.4	---	---	None	---	None
		February	1.3	1.4	---	---	None	---	None
		March	0.8	1.4	---	---	None	---	None
		April	0.2	1.4	---	---	None	---	None
		May	0.2	1.4	---	---	None	---	None
		June	0.6	1.4	---	---	None	---	None
		July	0.8	1.4	---	---	None	---	None
		September	0.8	1.4	---	---	None	---	None
		October	0.6	1.4	---	---	None	---	None
		November	0.3	1.4	---	---	None	---	None
		December	0.8	1.4	---	---	None	---	None
Insula, very stony, skeletal----	D	Jan-Dec	---	---	---	---	None	---	None
Dishno, very stony, skeletal----	B	April	0.6	1.3	---	---	None	---	None
		May	0.8	1.3	---	---	None	---	None
		June	0.8	1.3	---	---	None	---	None
		October	0.8	1.3	---	---	None	---	None
		November	0.6	1.3	---	---	None	---	None

Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srqw: Aquepts, stony, moderately slow Ksat-----	C/D	January	0.3	>2.0	---	---	---	---	None
		February	0.5	>2.0	---	---	---	---	None
		March	0.2	>2.0	---	---	---	---	None
		April	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		May	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		June	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		July	0.2	>2.0	---	---	---	---	None
		August	0.3	>2.0	---	---	---	---	None
		September	0.5	>2.0	---	---	---	---	None
		October	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		November	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		December	0.2	>2.0	---	---	---	---	None
Littleswan-----	C/D	January	1.5	>2.0	---	---	None	---	None
		February	1.5	>2.0	---	---	None	---	None
		March	0.9	>2.0	---	---	None	---	None
		April	0.5	>2.0	---	---	None	---	None
		May	0.5	>2.0	---	---	None	---	None
		June	0.6	>2.0	---	---	None	---	None
		July	0.8	>2.0	---	---	None	---	None
		August	0.9	>2.0	---	---	None	---	None
		September	0.9	>2.0	---	---	None	---	None
		October	0.8	>2.0	---	---	None	---	None
		November	0.6	>2.0	---	---	None	---	None
		December	0.9	>2.0	---	---	None	---	None

Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srqw: Aquepts, very rubbly-----	B/D	January	0.5	>2.0	---	---	---	---	None
		February	0.6	>2.0	---	---	---	---	None
		March	0.2	>2.0	---	---	---	---	None
		April	0.0	>2.0	0.1-0.2	Long (7 to 30 days)	Frequent	---	None
		May	0.0	>2.0	0.1-0.2	Long (7 to 30 days)	Frequent	---	None
		June	0.0	>2.0	---	---	---	---	None
		July	0.1	>2.0	---	---	---	---	None
		August	0.3	>2.0	---	---	---	---	None
		September	0.4	>2.0	---	---	---	---	None
		October	0.1	>2.0	---	---	---	---	None
		November	0.0	>2.0	---	---	---	---	None
		December	0.2	>2.0	---	---	---	---	None
		Rock outcrop.							
2srqy: Baudette-----	C	March	1.4	>2.0	---	---	None	---	None
		April	0.8	>2.0	---	---	None	---	None
		May	0.8	>2.0	---	---	None	---	None
		June	0.9	>2.0	---	---	None	---	None
		July	1.2	>2.0	---	---	None	---	None
		August	1.5	>2.0	---	---	None	---	None
		September	1.5	>2.0	---	---	None	---	None
		October	1.1	>2.0	---	---	None	---	None
		November	0.9	>2.0	---	---	None	---	None
		December	1.4	>2.0	---	---	None	---	None
Littleswan-----	C/D	January	1.5	>2.0	---	---	None	---	None
		February	1.5	>2.0	---	---	None	---	None
		March	0.9	>2.0	---	---	None	---	None
		April	0.5	>2.0	---	---	None	---	None
		May	0.5	>2.0	---	---	None	---	None
		June	0.6	>2.0	---	---	None	---	None
		July	0.8	>2.0	---	---	None	---	None
		August	0.9	>2.0	---	---	None	---	None
		September	0.9	>2.0	---	---	None	---	None
		October	0.8	>2.0	---	---	None	---	None
		November	0.6	>2.0	---	---	None	---	None
		December	0.9	>2.0	---	---	None	---	None

Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srqy: Voyageurs-----	C/D	January	1.2	1.4	---	---	None	---	None
		February	1.3	1.4	---	---	None	---	None
		March	0.8	1.4	---	---	None	---	None
		April	0.2	1.4	---	---	None	---	None
		May	0.2	1.4	---	---	None	---	None
		June	0.6	1.4	---	---	None	---	None
		July	0.8	1.4	---	---	None	---	None
		September	0.8	1.4	---	---	None	---	None
		October	0.6	1.4	---	---	None	---	None
		November	0.3	1.4	---	---	None	---	None
		December	0.8	1.4	---	---	None	---	None
Wahlsten, very stony-----	C	April	0.6	0.8	---	---	None	---	None
		May	0.8	0.8	---	---	None	---	None
		June	0.8	0.8	---	---	None	---	None
		October	0.8	0.8	---	---	None	---	None
		November	0.6	0.8	---	---	None	---	None
Insula, very stony, skeletal----	D	Jan-Dec	---	---	---	---	None	---	None
Spooner-----	C/D	January	1.2	>2.0	---	---	None	---	None
		February	1.2	>2.0	---	---	None	---	None
		March	0.6	>2.0	---	---	None	---	None
		April	0.2	>2.0	---	---	None	---	None
		May	0.2	>2.0	---	---	None	---	None
		June	0.3	>2.0	---	---	None	---	None
		July	0.5	>2.0	---	---	None	---	None
		August	0.6	>2.0	---	---	None	---	None
		September	0.6	>2.0	---	---	None	---	None
		October	0.5	>2.0	---	---	None	---	None
		November	0.3	>2.0	---	---	None	---	None
		December	0.6	>2.0	---	---	None	---	None
2srqz: Canthook-----	C/D	April	0.2	0.6	---	---	None	---	None
		May	0.2	0.6	---	---	None	---	None
		June	0.3	0.6	---	---	None	---	None
		October	0.4	0.6	---	---	None	---	None
		November	0.3	0.6	---	---	None	---	None



Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srqz: Durkeelake-----	B	April	0.6	0.8	---	---	None	---	None
		May	0.6	0.8	---	---	None	---	None
		November	0.6	0.8	---	---	None	---	None
Bootleg-----	C/D	March	0.6	0.8	---	---	None	---	None
		April	0.0	>2.0	---	---	None	---	None
		May	0.2	>2.0	---	---	None	---	None
		June	0.3	>2.0	---	---	None	---	None
		July	0.5	>2.0	---	---	None	---	None
		October	0.4	0.6	---	---	None	---	None
		November	0.3	>2.0	---	---	None	---	None
Udipsamments-----	A	Jan-Dec	---	---	---	---	None	---	None
Grytal-----	B	January	1.9	>2.0	---	---	None	---	None
		April	0.8	>2.0	---	---	None	---	None
		May	0.9	>2.0	---	---	None	---	None
		June	1.1	>2.0	---	---	None	---	None
		July	1.2	>2.0	---	---	None	---	None
		October	1.7	>2.0	---	---	None	---	None
		November	1.0	>2.0	---	---	None	---	None
		December	1.8	>2.0	---	---	None	---	None
Voyageurs-----	C/D	January	1.2	1.4	---	---	None	---	None
		February	1.3	1.4	---	---	None	---	None
		March	0.8	1.4	---	---	None	---	None
		April	0.2	1.4	---	---	None	---	None
		May	0.2	1.4	---	---	None	---	None
		June	0.6	1.4	---	---	None	---	None
		July	0.8	1.4	---	---	None	---	None
		September	0.8	1.4	---	---	None	---	None
		October	0.6	1.4	---	---	None	---	None
		November	0.3	1.4	---	---	None	---	None
		December	0.8	1.4	---	---	None	---	None

Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srqz: Aquepts, stony, moderately slow Ksat-----	C/D	January	0.3	>2.0	---	---	---	---	None
		February	0.5	>2.0	---	---	---	---	None
		March	0.2	>2.0	---	---	---	---	None
		April	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		May	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		June	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		July	0.2	>2.0	---	---	---	---	None
		August	0.3	>2.0	---	---	---	---	None
		September	0.5	>2.0	---	---	---	---	None
		October	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		November	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		December	0.2	>2.0	---	---	---	---	None
2srr3: Spooner-----	C/D	January	1.2	>2.0	---	---	None	---	None
		February	1.2	>2.0	---	---	None	---	None
		March	0.6	>2.0	---	---	None	---	None
		April	0.2	>2.0	---	---	None	---	None
		May	0.2	>2.0	---	---	None	---	None
		June	0.3	>2.0	---	---	None	---	None
		July	0.5	>2.0	---	---	None	---	None
		August	0.6	>2.0	---	---	None	---	None
		September	0.6	>2.0	---	---	None	---	None
		October	0.5	>2.0	---	---	None	---	None
		November	0.3	>2.0	---	---	None	---	None
		December	0.6	>2.0	---	---	None	---	None

Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srr3: Sax-----	B/D	January	0.3	>2.0	---	---	---	---	None
		February	0.3	>2.0	---	---	---	---	None
		March	0.2	>2.0	---	---	---	---	None
		April	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		May	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		June	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		July	0.2	>2.0	---	---	---	---	None
		August	0.3	>2.0	---	---	---	---	None
		September	0.3	>2.0	---	---	---	---	None
		October	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		November	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		December	0.2	>2.0	---	---	---	---	None
Spooner, till/bedrock substratum	C/D	January	1.2	1.4	---	---	None	---	None
		February	1.2	1.4	---	---	None	---	None
		March	0.6	1.4	---	---	None	---	None
		April	0.2	1.4	---	---	None	---	None
		May	0.2	1.4	---	---	None	---	None
		June	0.3	1.4	---	---	None	---	None
		July	0.5	1.4	---	---	None	---	None
		August	0.6	1.4	---	---	None	---	None
		September	0.6	1.4	---	---	None	---	None
		October	0.5	1.4	---	---	None	---	None
		November	0.3	1.4	---	---	None	---	None
		December	0.6	1.4	---	---	None	---	None

Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srr3: Foglake-----	C/D	January	1.2	>2.0	---	---	None	---	None
		February	1.2	>2.0	---	---	None	---	None
		March	0.6	>2.0	---	---	None	---	None
		April	0.2	>2.0	---	---	None	---	None
		May	0.2	>2.0	---	---	None	---	None
		June	0.3	>2.0	---	---	None	---	None
		July	0.5	>2.0	---	---	None	---	None
		August	0.6	>2.0	---	---	None	---	None
		September	0.6	>2.0	---	---	None	---	None
		October	0.5	>2.0	---	---	None	---	None
		November	0.3	>2.0	---	---	None	---	None
		December	0.6	>2.0	---	---	None	---	None
Little Swan-----	C/D	January	1.5	>2.0	---	---	None	---	None
		February	1.5	>2.0	---	---	None	---	None
		March	0.9	>2.0	---	---	None	---	None
		April	0.5	>2.0	---	---	None	---	None
		May	0.5	>2.0	---	---	None	---	None
		June	0.6	>2.0	---	---	None	---	None
		July	0.8	>2.0	---	---	None	---	None
		August	0.9	>2.0	---	---	None	---	None
		September	0.9	>2.0	---	---	None	---	None
		October	0.8	>2.0	---	---	None	---	None
		November	0.6	>2.0	---	---	None	---	None
		December	0.9	>2.0	---	---	None	---	None
Bootleg-----	C/D	March	0.6	0.8	---	---	None	---	None
		April	0.0	>2.0	---	---	None	---	None
		May	0.2	>2.0	---	---	None	---	None
		June	0.3	>2.0	---	---	None	---	None
		July	0.5	>2.0	---	---	None	---	None
		October	0.4	0.6	---	---	None	---	None
		November	0.3	>2.0	---	---	None	---	None
Canthook-----	C/D	April	0.2	0.6	---	---	None	---	None
		May	0.2	0.6	---	---	None	---	None
		June	0.3	0.6	---	---	None	---	None
		October	0.4	0.6	---	---	None	---	None
		November	0.3	0.6	---	---	None	---	None

Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srr4: Littleswan-----	C/D	January	1.5	>2.0	---	---	None	---	None
		February	1.5	>2.0	---	---	None	---	None
		March	0.9	>2.0	---	---	None	---	None
		April	0.5	>2.0	---	---	None	---	None
		May	0.5	>2.0	---	---	None	---	None
		June	0.6	>2.0	---	---	None	---	None
		July	0.8	>2.0	---	---	None	---	None
		August	0.9	>2.0	---	---	None	---	None
		September	0.9	>2.0	---	---	None	---	None
		October	0.8	>2.0	---	---	None	---	None
		November	0.6	>2.0	---	---	None	---	None
		December	0.9	>2.0	---	---	None	---	None
Spoonier-----	C/D	January	1.2	>2.0	---	---	None	---	None
		February	1.2	>2.0	---	---	None	---	None
		March	0.6	>2.0	---	---	None	---	None
		April	0.2	>2.0	---	---	None	---	None
		May	0.2	>2.0	---	---	None	---	None
		June	0.3	>2.0	---	---	None	---	None
		July	0.5	>2.0	---	---	None	---	None
		August	0.6	>2.0	---	---	None	---	None
		September	0.6	>2.0	---	---	None	---	None
		October	0.5	>2.0	---	---	None	---	None
		November	0.3	>2.0	---	---	None	---	None
		December	0.6	>2.0	---	---	None	---	None
Voyageurs-----	C/D	January	1.2	1.4	---	---	None	---	None
		February	1.3	1.4	---	---	None	---	None
		March	0.8	1.4	---	---	None	---	None
		April	0.2	1.4	---	---	None	---	None
		May	0.2	1.4	---	---	None	---	None
		June	0.6	1.4	---	---	None	---	None
		July	0.8	1.4	---	---	None	---	None
		September	0.8	1.4	---	---	None	---	None
		October	0.6	1.4	---	---	None	---	None
		November	0.3	1.4	---	---	None	---	None
		December	0.8	1.4	---	---	None	---	None

Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srr4: Spoonier, till/bedrock substratum	C/D	January	1.2	1.4	---	---	None	---	None
		February	1.2	1.4	---	---	None	---	None
		March	0.6	1.4	---	---	None	---	None
		April	0.2	1.4	---	---	None	---	None
		May	0.2	1.4	---	---	None	---	None
		June	0.3	1.4	---	---	None	---	None
		July	0.5	1.4	---	---	None	---	None
		August	0.6	1.4	---	---	None	---	None
		September	0.6	1.4	---	---	None	---	None
		October	0.5	1.4	---	---	None	---	None
		November	0.3	1.4	---	---	None	---	None
		December	0.6	1.4	---	---	None	---	None
Sax-----	B/D	January	0.3	>2.0	---	---	---	---	None
		February	0.3	>2.0	---	---	---	---	None
		March	0.2	>2.0	---	---	---	---	None
		April	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		May	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		June	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		July	0.2	>2.0	---	---	---	---	None
		August	0.3	>2.0	---	---	---	---	None
		September	0.3	>2.0	---	---	---	---	None
		October	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		November	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		December	0.2	>2.0	---	---	---	---	None

Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srr4: Foglake-----	C/D	January	1.2	>2.0	---	---	None	---	None
		February	1.2	>2.0	---	---	None	---	None
		March	0.6	>2.0	---	---	None	---	None
		April	0.2	>2.0	---	---	None	---	None
		May	0.2	>2.0	---	---	None	---	None
		June	0.3	>2.0	---	---	None	---	None
		July	0.5	>2.0	---	---	None	---	None
		August	0.6	>2.0	---	---	None	---	None
		September	0.6	>2.0	---	---	None	---	None
		October	0.5	>2.0	---	---	None	---	None
		November	0.3	>2.0	---	---	None	---	None
		December	0.6	>2.0	---	---	None	---	None
Bootleg-----	C/D	March	0.6	0.8	---	---	None	---	None
		April	0.0	>2.0	---	---	None	---	None
		May	0.2	>2.0	---	---	None	---	None
		June	0.3	>2.0	---	---	None	---	None
		July	0.5	>2.0	---	---	None	---	None
		October	0.4	0.6	---	---	None	---	None
		November	0.3	>2.0	---	---	None	---	None
Canthook-----	C/D	April	0.2	0.6	---	---	None	---	None
		May	0.2	0.6	---	---	None	---	None
		June	0.3	0.6	---	---	None	---	None
		October	0.4	0.6	---	---	None	---	None
		November	0.3	0.6	---	---	None	---	None
2srr7: Mooselake-----	A/D	January	0.3	>2.0	---	---	---	---	None
		February	0.4	>2.0	---	---	---	---	None
		March	0.3	>2.0	---	---	---	---	None
		April	0.0	>2.0	0.1-0.2	Long (7 to 30 days)	Frequent	---	None
		May	0.1	>2.0	---	---	---	---	None
		June	0.1	>2.0	---	---	---	---	None
		July	0.2	>2.0	---	---	---	---	None
		August	0.3	>2.0	---	---	---	---	None
		September	0.3	>2.0	---	---	---	---	None
		October	0.2	>2.0	---	---	---	---	None
		November	0.0	>2.0	---	---	---	---	None
		December	0.2	>2.0	---	---	---	---	None



Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srr7: Tacoosh, moat-----	A/D	January	0.2	>2.0	---	---	---	---	None
		February	0.3	>2.0	---	---	---	---	None
		March	0.2	>2.0	---	---	---	---	None
		April	0.0	>2.0	0.1-0.2	Long (7 to 30 days)	Frequent	---	None
		May	0.0	>2.0	0.0-0.2	Long (7 to 30 days)	Frequent	---	None
		June	0.0	>2.0	---	---	---	---	None
		July	0.1	>2.0	---	---	---	---	None
		August	0.2	>2.0	---	---	---	---	None
		September	0.2	>2.0	---	---	---	---	None
		October	0.1	>2.0	---	---	---	---	None
		November	0.0	>2.0	0.0-0.2	Long (7 to 30 days)	Frequent	---	None
		December	0.1	>2.0	---	---	---	---	None
Rifle-----	A/D	January	0.3	>2.0	---	---	---	---	None
		February	0.4	>2.0	---	---	---	---	None
		March	0.3	>2.0	---	---	---	---	None
		April	0.0	>2.0	0.1-0.2	Long (7 to 30 days)	Occasional	---	None
		May	0.1	>2.0	---	---	---	---	None
		June	0.1	>2.0	---	---	---	---	None
		July	0.2	>2.0	---	---	---	---	None
		August	0.3	>2.0	---	---	---	---	None
		September	0.3	>2.0	---	---	---	---	None
		October	0.2	>2.0	---	---	---	---	None
		November	0.0	>2.0	---	---	---	---	None
		December	0.2	>2.0	---	---	---	---	None

Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srr7: Cathro, moat-----	C/D	January	0.2	>2.0	---	---	---	---	None
		February	0.3	>2.0	---	---	---	---	None
		March	0.2	>2.0	---	---	---	---	None
		April	0.0	>2.0	0.1-0.2	Long (7 to 30 days)	Frequent	---	None
		May	0.0	>2.0	0.0-0.2	Long (7 to 30 days)	Frequent	---	None
		June	0.1	>2.0	---	---	---	---	None
		July	0.1	>2.0	---	---	---	---	None
		August	0.2	>2.0	---	---	---	---	None
		September	0.2	>2.0	---	---	---	---	None
		October	0.1	>2.0	---	---	---	---	None
		November	0.0	>2.0	0.0-0.2	Long (7 to 30 days)	Frequent	---	None
		December	0.1	>2.0	---	---	---	---	None
2srr8: Rifle-----	A/D	January	0.3	>2.0	---	---	---	---	None
		February	0.4	>2.0	---	---	---	---	None
		March	0.3	>2.0	---	---	---	---	None
		April	0.0	>2.0	0.1-0.2	Long (7 to 30 days)	Occasional	---	None
		May	0.1	>2.0	---	---	---	---	None
		June	0.1	>2.0	---	---	---	---	None
		July	0.2	>2.0	---	---	---	---	None
		August	0.3	>2.0	---	---	---	---	None
		September	0.3	>2.0	---	---	---	---	None
		October	0.2	>2.0	---	---	---	---	None
		November	0.0	>2.0	---	---	---	---	None
		December	0.2	>2.0	---	---	---	---	None

Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srr8: Tacoosh, moat-----	A/D	January	0.2	>2.0	---	---	---	---	None
		February	0.3	>2.0	---	---	---	---	None
		March	0.2	>2.0	---	---	---	---	None
		April	0.0	>2.0	0.1-0.2	Long (7 to 30 days)	Frequent	---	None
		May	0.0	>2.0	0.0-0.2	Long (7 to 30 days)	Frequent	---	None
		June	0.0	>2.0	---	---	---	---	None
		July	0.1	>2.0	---	---	---	---	None
		August	0.2	>2.0	---	---	---	---	None
		September	0.2	>2.0	---	---	---	---	None
		October	0.1	>2.0	---	---	---	---	None
		November	0.0	>2.0	0.0-0.2	Long (7 to 30 days)	Frequent	---	None
		December	0.1	>2.0	---	---	---	---	None
Greenwood-----	A/D	January	0.4	>2.0	---	---	None	---	None
		February	0.5	>2.0	---	---	None	---	None
		March	0.4	>2.0	---	---	None	---	None
		April	0.2	>2.0	---	---	None	---	None
		May	0.2	>2.0	---	---	None	---	None
		June	0.2	>2.0	---	---	None	---	None
		July	0.2	>2.0	---	---	None	---	None
		August	0.3	>2.0	---	---	None	---	None
		September	0.3	>2.0	---	---	None	---	None
		October	0.2	>2.0	---	---	None	---	None
		November	0.2	>2.0	---	---	None	---	None
		December	0.3	>2.0	---	---	None	---	None

Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srr8: Aquepts, stony, moderately slow Ksat-----	C/D	January	0.3	>2.0	---	---	---	---	None
		February	0.5	>2.0	---	---	---	---	None
		March	0.2	>2.0	---	---	---	---	None
		April	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		May	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		June	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		July	0.2	>2.0	---	---	---	---	None
		August	0.3	>2.0	---	---	---	---	None
		September	0.5	>2.0	---	---	---	---	None
		October	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		November	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		December	0.2	>2.0	---	---	---	---	None
2srr9: Tacoosh, frequently flooded-----	A/D	January	0.0	>2.0	---	---	None	---	---
		February	0.0	>2.0	---	---	None	---	---
		March	0.0	>2.0	---	---	None	---	---
		April	0.0	>2.0	---	---	None	Long (7 to 30 days)	Frequent
		May	0.0	>2.0	---	---	None	Long (7 to 30 days)	Frequent
		June	0.0	>2.0	---	---	None	Long (7 to 30 days)	Frequent
		July	0.0	>2.0	---	---	None	---	---
		August	0.0	>2.0	---	---	None	---	---
		September	0.0	>2.0	---	---	None	---	---
		October	0.0	>2.0	---	---	None	---	---
		November	0.0	>2.0	---	---	None	---	---
		December	0.0	>2.0	---	---	None	---	---

Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srr9: Sax, frequently flooded-----	B/D	January	0.0	>2.0	---	---	None	---	---
		February	0.0	>2.0	---	---	None	---	---
		March	0.0	>2.0	---	---	None	---	---
		April	0.0	>2.0	---	---	None	Long (7 to 30 days)	Frequent
		May	0.0	>2.0	---	---	None	Long (7 to 30 days)	Frequent
		June	0.0	>2.0	---	---	None	Long (7 to 30 days)	Frequent
		July	0.0	>2.0	---	---	None	---	---
		August	0.0	>2.0	---	---	None	---	---
		September	0.0	>2.0	---	---	None	---	---
		October	0.0	>2.0	---	---	None	---	---
		November	0.0	>2.0	---	---	None	---	---
		December	0.0	>2.0	---	---	None	---	---
Cathro, frequently flooded-----	C/D	January	0.0	>2.0	---	---	None	---	---
		February	0.0	>2.0	---	---	None	---	---
		March	0.0	>2.0	---	---	None	---	---
		April	0.0	>2.0	---	---	None	Long (7 to 30 days)	Frequent
		May	0.0	>2.0	---	---	None	Long (7 to 30 days)	Frequent
		June	0.0	>2.0	---	---	None	Long (7 to 30 days)	Frequent
		July	0.0	>2.0	---	---	None	---	---
		August	0.0	>2.0	---	---	None	---	---
		September	0.0	>2.0	---	---	None	---	---
		October	0.0	>2.0	---	---	None	---	---
		November	0.0	>2.0	---	---	None	---	---
		December	0.0	>2.0	---	---	None	---	---

Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srr9: Rifle, frequently flooded-----	A/D	January	0.0	>2.0	---	---	None	---	---
		February	0.0	>2.0	---	---	None	---	---
		March	0.0	>2.0	---	---	None	---	---
		April	0.0	>2.0	---	---	None	Long (7 to 30 days)	Frequent
		May	0.0	>2.0	---	---	None	Long (7 to 30 days)	Frequent
		June	0.0	>2.0	---	---	None	Long (7 to 30 days)	Frequent
		July	0.0	>2.0	---	---	None	---	---
		August	0.0	>2.0	---	---	None	---	---
		September	0.0	>2.0	---	---	None	---	---
		October	0.0	>2.0	---	---	None	---	---
		November	0.0	>2.0	---	---	None	---	---
		December	0.0	>2.0	---	---	None	---	---
Hassman, frequently flooded-----	C/D	January	0.0	>2.0	---	---	None	---	---
		February	0.0	>2.0	---	---	None	---	---
		March	0.0	>2.0	---	---	None	---	---
		April	0.0	>2.0	---	---	None	Long (7 to 30 days)	Frequent
		May	0.0	>2.0	---	---	None	Long (7 to 30 days)	Frequent
		June	0.0	>2.0	---	---	None	Long (7 to 30 days)	Frequent
		July	0.0	>2.0	---	---	None	---	---
		August	0.0	>2.0	---	---	None	---	---
		September	0.0	>2.0	---	---	None	---	---
		October	0.0	>2.0	---	---	None	---	---
		November	0.0	>2.0	---	---	None	---	---
		December	0.0	>2.0	---	---	None	---	---

Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srrb: Aquents, ponded-----	B/D	January	0.0	>2.0	---	---	---	---	None
		February	0.0	>2.0	---	---	---	---	None
		March	0.0	>2.0	---	---	---	---	None
		April	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		May	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		June	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		July	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		August	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		September	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		October	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		November	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		December	0.0	>2.0	---	---	---	---	None



Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srrb: Sax, ponded-----	B/D	January	0.3	>2.0	---	---	---	---	None
		February	0.3	>2.0	---	---	---	---	None
		March	0.2	>2.0	---	---	---	---	None
		April	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		May	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		June	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		July	0.2	>2.0	---	---	---	---	None
		August	0.3	>2.0	---	---	---	---	None
		September	0.3	>2.0	---	---	---	---	None
		October	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		November	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		December	0.2	>2.0	---	---	---	---	None
Tacoosh, ponded-----	A/D	January	0.3	>2.0	---	---	---	---	None
		February	0.3	>2.0	---	---	---	---	None
		March	0.3	>2.0	---	---	---	---	None
		April	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		May	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		June	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		July	0.2	>2.0	---	---	---	---	None
		August	0.3	>2.0	---	---	---	---	None
		September	0.3	>2.0	---	---	---	---	None
		October	0.2	>2.0	---	---	---	---	None
		November	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		December	0.2	>2.0	---	---	---	---	None

Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srrb: Rifle, ponded-----	A/D	January	0.3	>2.0	---	---	---	---	None
		February	0.3	>2.0	---	---	---	---	None
		March	0.3	>2.0	---	---	---	---	None
		April	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		May	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		June	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		July	0.2	>2.0	---	---	---	---	None
		August	0.3	>2.0	---	---	---	---	None
		September	0.3	>2.0	---	---	---	---	None
		October	0.2	>2.0	---	---	---	---	None
		November	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		December	0.2	>2.0	---	---	---	---	None
Hassman, ponded-----	C/D	January	0.5	>2.0	---	---	---	---	None
		February	0.6	>2.0	---	---	---	---	None
		March	0.3	>2.0	---	---	---	---	None
		April	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		May	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		June	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		July	0.2	>2.0	---	---	---	---	None
		August	0.3	>2.0	---	---	---	---	None
		September	0.3	>2.0	---	---	---	---	None
		October	0.2	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		November	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		December	0.2	>2.0	---	---	---	---	None

Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srrh: Greenwood, seasonally ponded----	A/D	January	0.2	>2.0	---	---	---	---	None
		February	0.3	>2.0	---	---	---	---	None
		March	0.2	>2.0	---	---	---	---	None
		April	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		May	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		June	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		July	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		August	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		September	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		October	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		November	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		December	0.2	>2.0	---	---	---	---	None

Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srrh: Merwin, seasonally ponded-----	C/D	January	0.2	>2.0	---	---	---	---	None
		February	0.3	>2.0	---	---	---	---	None
		March	0.2	>2.0	---	---	---	---	None
		April	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		May	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		June	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		July	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		August	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		September	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		October	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		November	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		December	0.2	>2.0	---	---	---	---	None

Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srrh: Rifle, seasonally ponded-----	A/D	January	0.2	>2.0	---	---	---	---	None
		February	0.3	>2.0	---	---	---	---	None
		March	0.2	>2.0	---	---	---	---	None
		April	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		May	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		June	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		July	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		August	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		September	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		October	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		November	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		December	0.2	>2.0	---	---	---	---	None

Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srrh: Tacoosh, seasonally ponded-----	A/D	January	0.2	>2.0	---	---	---	---	None
		February	0.3	>2.0	---	---	---	---	None
		March	0.2	>2.0	---	---	---	---	None
		April	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		May	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		June	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		July	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		August	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		September	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		October	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		November	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		December	0.2	>2.0	---	---	---	---	None

Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srrj: Rifle, seasonally ponded-----	A/D	January	0.2	>2.0	---	---	---	---	None
		February	0.3	>2.0	---	---	---	---	None
		March	0.2	>2.0	---	---	---	---	None
		April	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		May	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		June	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		July	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		August	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		September	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		October	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		November	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		December	0.2	>2.0	---	---	---	---	None



Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srrj: Tacoosh, seasonally ponded-----	A/D	January	0.2	>2.0	---	---	---	---	None
		February	0.3	>2.0	---	---	---	---	None
		March	0.2	>2.0	---	---	---	---	None
		April	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		May	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		June	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		July	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		August	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		September	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		October	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		November	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		December	0.2	>2.0	---	---	---	---	None

Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srrj: Greenwood, seasonally ponded----	A/D	January	0.2	>2.0	---	---	---	---	None
		February	0.3	>2.0	---	---	---	---	None
		March	0.2	>2.0	---	---	---	---	None
		April	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		May	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		June	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		July	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		August	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		September	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		October	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		November	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		December	0.2	>2.0	---	---	---	---	None

Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srrj: Aquepts, stony, moderately slow Ksat-----	C/D	January	0.3	>2.0	---	---	---	---	None
		February	0.5	>2.0	---	---	---	---	None
		March	0.2	>2.0	---	---	---	---	None
		April	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		May	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		June	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		July	0.2	>2.0	---	---	---	---	None
		August	0.3	>2.0	---	---	---	---	None
		September	0.5	>2.0	---	---	---	---	None
		October	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		November	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		December	0.2	>2.0	---	---	---	---	None
2srrk: Insula, very stony, skeletal----	D	Jan-Dec	---	---	---	---	None	---	None
Conic, very stony, skeletal----		Jan-Dec	---	---	---	---	None	---	None
Wahlsten, very stony-----	C	April	0.6	0.8	---	---	None	---	None
		May	0.8	0.8	---	---	None	---	None
		June	0.8	0.8	---	---	None	---	None
		October	0.8	0.8	---	---	None	---	None
		November	0.6	0.8	---	---	None	---	None
Quetico, very stony, skeletal---	D	Jan-Dec	---	---	---	---	None	---	None
Metonga, very stony, skeletal---		Jan-Dec	---	---	---	---	None	---	None

Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srrk: Dishno, very stony, skeletal----	B	April	0.6	1.3	---	---	None	---	None
		May	0.8	1.3	---	---	None	---	None
		June	0.8	1.3	---	---	None	---	None
		October	0.8	1.3	---	---	None	---	None
		November	0.6	1.3	---	---	None	---	None
Aquepts, very rubbly-----	B/D	January	0.5	>2.0	---	---	---	---	None
		February	0.6	>2.0	---	---	---	---	None
		March	0.2	>2.0	---	---	---	---	None
		April	0.0	>2.0	0.1-0.2	Long (7 to 30 days)	Frequent	---	None
		May	0.0	>2.0	0.1-0.2	Long (7 to 30 days)	Frequent	---	None
		June	0.0	>2.0	---	---	---	---	None
		July	0.1	>2.0	---	---	---	---	None
		August	0.3	>2.0	---	---	---	---	None
		September	0.4	>2.0	---	---	---	---	None
		October	0.1	>2.0	---	---	---	---	None
		November	0.0	>2.0	---	---	---	---	None
		December	0.2	>2.0	---	---	---	---	None

Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srrk: Aquepts, stony, moderately slow Ksat-----	C/D	January	0.3	>2.0	---	---	---	---	None
		February	0.5	>2.0	---	---	---	---	None
		March	0.2	>2.0	---	---	---	---	None
		April	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		May	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		June	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		July	0.2	>2.0	---	---	---	---	None
		August	0.3	>2.0	---	---	---	---	None
		September	0.5	>2.0	---	---	---	---	None
		October	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		November	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		December	0.2	>2.0	---	---	---	---	None
		December	0.2	>2.0	---	---	---	---	None
Voyageurs-----	C/D	January	1.2	1.4	---	---	None	---	None
		February	1.3	1.4	---	---	None	---	None
		March	0.8	1.4	---	---	None	---	None
		April	0.2	1.4	---	---	None	---	None
		May	0.2	1.4	---	---	None	---	None
		June	0.6	1.4	---	---	None	---	None
		July	0.8	1.4	---	---	None	---	None
		September	0.8	1.4	---	---	None	---	None
		October	0.6	1.4	---	---	None	---	None
		November	0.3	1.4	---	---	None	---	None
		December	0.8	1.4	---	---	None	---	None
		December	0.8	1.4	---	---	None	---	None

Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srrk: Rock outcrop.									
Foglake-----	C/D	January	1.2	>2.0	---	---	None	---	None
		February	1.2	>2.0	---	---	None	---	None
		March	0.6	>2.0	---	---	None	---	None
		April	0.2	>2.0	---	---	None	---	None
		May	0.2	>2.0	---	---	None	---	None
		June	0.3	>2.0	---	---	None	---	None
		July	0.5	>2.0	---	---	None	---	None
		August	0.6	>2.0	---	---	None	---	None
		September	0.6	>2.0	---	---	None	---	None
		October	0.5	>2.0	---	---	None	---	None
		November	0.3	>2.0	---	---	None	---	None
		December	0.6	>2.0	---	---	None	---	None
Eaglesnest, very stony-----	C	April	0.6	1.2	---	---	None	---	None
		May	0.8	1.3	---	---	None	---	None
		June	0.9	1.3	---	---	None	---	None
		October	0.9	1.3	---	---	None	---	None
		November	0.9	1.3	---	---	None	---	None
		December	1.1	1.3	---	---	None	---	None
2srrl: Tacoosh, occasionally flooded---	A/D	January	0.2	>2.0	---	---	None	---	---
		February	0.2	>2.0	---	---	None	---	---
		March	0.0	>2.0	---	---	None	---	---
		April	0.0	>2.0	---	---	None	Long (7 to 30 days)	Occasional
		May	0.0	>2.0	---	---	None	Long (7 to 30 days)	Occasional
		June	0.0	>2.0	---	---	None	Long (7 to 30 days)	Occasional
		July	0.0	>2.0	---	---	None	---	---
		August	0.0	>2.0	---	---	None	---	---
		September	0.2	>2.0	---	---	None	---	---
		October	0.2	>2.0	---	---	None	---	---
		November	0.2	>2.0	---	---	None	---	---
		December	0.2	>2.0	---	---	None	---	---

Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srrl: Sax, occasionally flooded-----	B/D	January	0.2	>2.0	---	---	None	---	---
		February	0.2	>2.0	---	---	None	---	---
		March	0.0	>2.0	---	---	None	---	---
		April	0.0	>2.0	---	---	None	Long (7 to 30 days)	Occasional
		May	0.0	>2.0	---	---	None	Long (7 to 30 days)	Occasional
		June	0.0	>2.0	---	---	None	Long (7 to 30 days)	Occasional
		July	0.0	>2.0	---	---	None	---	---
		August	0.0	>2.0	---	---	None	---	---
		September	0.2	>2.0	---	---	None	---	---
		October	0.2	>2.0	---	---	None	---	---
		November	0.2	>2.0	---	---	None	---	---
		December	0.2	>2.0	---	---	None	---	---
Cathro, occasionally flooded----	C/D	January	0.2	>2.0	---	---	None	---	---
		February	0.2	>2.0	---	---	None	---	---
		March	0.0	>2.0	---	---	None	---	---
		April	0.0	>2.0	---	---	None	Long (7 to 30 days)	Occasional
		May	0.0	>2.0	---	---	None	Long (7 to 30 days)	Occasional
		June	0.0	>2.0	---	---	None	Long (7 to 30 days)	Occasional
		July	0.0	>2.0	---	---	None	---	---
		August	0.0	>2.0	---	---	None	---	---
		September	0.2	>2.0	---	---	None	---	---
		October	0.2	>2.0	---	---	None	---	---
		November	0.2	>2.0	---	---	None	---	---
		December	0.2	>2.0	---	---	None	---	---



Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srrl: Rifle, occasionally flooded-----	A/D	January	0.2	>2.0	---	---	None	---	---
		February	0.2	>2.0	---	---	None	---	---
		March	0.0	>2.0	---	---	None	---	---
		April	0.0	>2.0	---	---	None	Long (7 to 30 days)	Occasional
		May	0.0	>2.0	---	---	None	Long (7 to 30 days)	Occasional
		June	0.0	>2.0	---	---	None	Long (7 to 30 days)	Occasional
		July	0.0	>2.0	---	---	None	---	---
		August	0.0	>2.0	---	---	None	---	---
		September	0.2	>2.0	---	---	None	---	---
		October	0.2	>2.0	---	---	None	---	---
		November	0.2	>2.0	---	---	None	---	---
		December	0.2	>2.0	---	---	None	---	---
Hassman, occasionally flooded---	C/D	January	0.2	>2.0	---	---	None	---	---
		February	0.2	>2.0	---	---	None	---	---
		March	0.0	>2.0	---	---	None	---	---
		April	0.0	>2.0	---	---	None	Long (7 to 30 days)	Occasional
		May	0.0	>2.0	---	---	None	Long (7 to 30 days)	Occasional
		June	0.0	>2.0	---	---	None	Long (7 to 30 days)	Occasional
		July	0.0	>2.0	---	---	None	---	---
		August	0.0	>2.0	---	---	None	---	---
		September	0.2	>2.0	---	---	None	---	---
		October	0.2	>2.0	---	---	None	---	---
		November	0.2	>2.0	---	---	None	---	---
		December	0.2	>2.0	---	---	None	---	---

Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srrm: Brickton-----	C/D	January	1.2	>2.0	---	---	None	---	None
		February	1.4	>2.0	---	---	None	---	None
		March	1.2	>2.0	---	---	None	---	None
		April	0.0	>2.0	---	---	None	---	None
		May	0.2	>2.0	---	---	None	---	None
		June	0.5	>2.0	---	---	None	---	None
		July	0.8	>2.0	---	---	None	---	None
		August	1.1	>2.0	---	---	None	---	None
		September	1.4	>2.0	---	---	None	---	None
		October	1.1	>2.0	---	---	None	---	None
		November	0.6	>2.0	---	---	None	---	None
		December	1.1	>2.0	---	---	None	---	None
Hassman-----	C/D	January	0.5	>2.0	---	---	---	---	None
		February	0.6	>2.0	---	---	---	---	None
		March	0.3	>2.0	---	---	---	---	None
		April	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		May	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		June	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		July	0.2	>2.0	---	---	---	---	None
		August	0.3	>2.0	---	---	---	---	None
		September	0.3	>2.0	---	---	---	---	None
		October	0.2	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		November	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		December	0.2	>2.0	---	---	---	---	None

Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srrm: Spooner, till/bedrock substratum	C/D	January	1.2	1.4	---	---	None	---	None
		February	1.2	1.4	---	---	None	---	None
		March	0.6	1.4	---	---	None	---	None
		April	0.2	1.4	---	---	None	---	None
		May	0.2	1.4	---	---	None	---	None
		June	0.3	1.4	---	---	None	---	None
		July	0.5	1.4	---	---	None	---	None
		August	0.6	1.4	---	---	None	---	None
		September	0.6	1.4	---	---	None	---	None
		October	0.5	1.4	---	---	None	---	None
		November	0.3	1.4	---	---	None	---	None
		December	0.6	1.4	---	---	None	---	None
Foglake-----	C/D	January	1.2	>2.0	---	---	None	---	None
		February	1.2	>2.0	---	---	None	---	None
		March	0.6	>2.0	---	---	None	---	None
		April	0.2	>2.0	---	---	None	---	None
		May	0.2	>2.0	---	---	None	---	None
		June	0.3	>2.0	---	---	None	---	None
		July	0.5	>2.0	---	---	None	---	None
		August	0.6	>2.0	---	---	None	---	None
		September	0.6	>2.0	---	---	None	---	None
		October	0.5	>2.0	---	---	None	---	None
		November	0.3	>2.0	---	---	None	---	None
		December	0.6	>2.0	---	---	None	---	None
Dalbo-----	C/D	March	0.5	0.8	---	---	None	---	None
		April	0.2	0.8	---	---	None	---	None
		May	0.3	0.8	---	---	None	---	None
		June	0.5	0.8	---	---	None	---	None
		October	0.3	0.8	---	---	None	---	None
		November	0.2	0.8	---	---	None	---	None
		December	0.5	0.8	---	---	None	---	None
Bootleg-----	C/D	March	0.6	0.8	---	---	None	---	None
		April	0.0	>2.0	---	---	None	---	None
		May	0.2	>2.0	---	---	None	---	None
		June	0.3	>2.0	---	---	None	---	None
		July	0.5	>2.0	---	---	None	---	None
		October	0.4	0.6	---	---	None	---	None
		November	0.3	>2.0	---	---	None	---	None

Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srrm: Tacoosh-----	A/D	January	0.3	>2.0	---	---	---	---	None
		February	0.3	>2.0	---	---	---	---	None
		March	0.3	>2.0	---	---	---	---	None
		April	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		May	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		June	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		July	0.2	>2.0	---	---	---	---	None
		August	0.3	>2.0	---	---	---	---	None
		September	0.3	>2.0	---	---	---	---	None
		October	0.2	>2.0	---	---	---	---	None
		November	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		December	0.2	>2.0	---	---	---	---	None
2srrn: Brickton-----	C/D	January	1.2	>2.0	---	---	None	---	None
		February	1.4	>2.0	---	---	None	---	None
		March	1.2	>2.0	---	---	None	---	None
		April	0.0	>2.0	---	---	None	---	None
		May	0.2	>2.0	---	---	None	---	None
		June	0.5	>2.0	---	---	None	---	None
		July	0.8	>2.0	---	---	None	---	None
		August	1.1	>2.0	---	---	None	---	None
		September	1.4	>2.0	---	---	None	---	None
		October	1.1	>2.0	---	---	None	---	None
		November	0.6	>2.0	---	---	None	---	None
		December	1.1	>2.0	---	---	None	---	None
Dalbo-----	C/D	March	0.5	0.8	---	---	None	---	None
		April	0.2	0.8	---	---	None	---	None
		May	0.3	0.8	---	---	None	---	None
		June	0.5	0.8	---	---	None	---	None
		October	0.3	0.8	---	---	None	---	None
		November	0.2	0.8	---	---	None	---	None
		December	0.5	0.8	---	---	None	---	None

Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srrn: Voyageurs-----	C/D	January	1.2	1.4	---	---	None	---	None
		February	1.3	1.4	---	---	None	---	None
		March	0.8	1.4	---	---	None	---	None
		April	0.2	1.4	---	---	None	---	None
		May	0.2	1.4	---	---	None	---	None
		June	0.6	1.4	---	---	None	---	None
		July	0.8	1.4	---	---	None	---	None
		September	0.8	1.4	---	---	None	---	None
		October	0.6	1.4	---	---	None	---	None
		November	0.3	1.4	---	---	None	---	None
		December	0.8	1.4	---	---	None	---	None
Foglake-----	C/D	January	1.2	>2.0	---	---	None	---	None
		February	1.2	>2.0	---	---	None	---	None
		March	0.6	>2.0	---	---	None	---	None
		April	0.2	>2.0	---	---	None	---	None
		May	0.2	>2.0	---	---	None	---	None
		June	0.3	>2.0	---	---	None	---	None
		July	0.5	>2.0	---	---	None	---	None
		August	0.6	>2.0	---	---	None	---	None
		September	0.6	>2.0	---	---	None	---	None
		October	0.5	>2.0	---	---	None	---	None
		November	0.3	>2.0	---	---	None	---	None
		December	0.6	>2.0	---	---	None	---	None
Spooner, till/bedrock substratum	C/D	January	1.2	1.4	---	---	None	---	None
		February	1.2	1.4	---	---	None	---	None
		March	0.6	1.4	---	---	None	---	None
		April	0.2	1.4	---	---	None	---	None
		May	0.2	1.4	---	---	None	---	None
		June	0.3	1.4	---	---	None	---	None
		July	0.5	1.4	---	---	None	---	None
		August	0.6	1.4	---	---	None	---	None
		September	0.6	1.4	---	---	None	---	None
		October	0.5	1.4	---	---	None	---	None
		November	0.3	1.4	---	---	None	---	None
		December	0.6	1.4	---	---	None	---	None

Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srrn: Bootleg-----	C/D	March	0.6	0.8	---	---	None	---	None
		April	0.0	>2.0	---	---	None	---	None
		May	0.2	>2.0	---	---	None	---	None
		June	0.3	>2.0	---	---	None	---	None
		July	0.5	>2.0	---	---	None	---	None
		October	0.4	0.6	---	---	None	---	None
		November	0.3	>2.0	---	---	None	---	None
Hassman-----	C/D	January	0.5	>2.0	---	---	---	---	None
		February	0.6	>2.0	---	---	---	---	None
		March	0.3	>2.0	---	---	---	---	None
		April	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		May	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		June	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		July	0.2	>2.0	---	---	---	---	None
		August	0.3	>2.0	---	---	---	---	None
		September	0.3	>2.0	---	---	---	---	None
		October	0.2	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		November	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		December	0.2	>2.0	---	---	---	---	None

Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srrq: Cathro, ponded-----	C/D	January	0.2	>2.0	---	---	---	---	None
		February	0.3	>2.0	---	---	---	---	None
		March	0.2	>2.0	---	---	---	---	None
		April	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		May	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		June	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		July	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		August	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		September	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		October	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		November	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		December	0.2	>2.0	---	---	---	---	None



Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srrq: Tacoosh, ponded-----	A/D	January	0.2	>2.0	---	---	---	---	None
		February	0.3	>2.0	---	---	---	---	None
		March	0.2	>2.0	---	---	---	---	None
		April	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		May	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		June	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		July	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		August	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		September	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		October	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		November	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		December	0.2	>2.0	---	---	---	---	None

Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srrq: Sax, ponded-----	B/D	January	0.3	>2.0	---	---	---	---	None
		February	0.3	>2.0	---	---	---	---	None
		March	0.2	>2.0	---	---	---	---	None
		April	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		May	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		June	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		July	0.2	>2.0	---	---	---	---	None
		August	0.3	>2.0	---	---	---	---	None
		September	0.3	>2.0	---	---	---	---	None
		October	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		November	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		December	0.2	>2.0	---	---	---	---	None

Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srrq: Aquepts, stony, moderately slow Ksat-----	C/D	January	0.3	>2.0	---	---	---	---	None
		February	0.5	>2.0	---	---	---	---	None
		March	0.2	>2.0	---	---	---	---	None
		April	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		May	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		June	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		July	0.2	>2.0	---	---	---	---	None
		August	0.3	>2.0	---	---	---	---	None
		September	0.5	>2.0	---	---	---	---	None
		October	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		November	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		December	0.2	>2.0	---	---	---	---	None
2srrr: Insula, very stony, skeletal----	D	Jan-Dec	---	---	---	---	None	---	None
Voyageurs-----									
	C/D	January	1.2	1.4	---	---	None	---	None
		February	1.3	1.4	---	---	None	---	None
		March	0.8	1.4	---	---	None	---	None
		April	0.2	1.4	---	---	None	---	None
		May	0.2	1.4	---	---	None	---	None
		June	0.6	1.4	---	---	None	---	None
		July	0.8	1.4	---	---	None	---	None
		September	0.8	1.4	---	---	None	---	None
		October	0.6	1.4	---	---	None	---	None
		November	0.3	1.4	---	---	None	---	None
		December	0.8	1.4	---	---	None	---	None

Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srrr: Wahlsten, very stony-----	C	April	0.6	0.8	---	---	None	---	None
		May	0.8	0.8	---	---	None	---	None
		June	0.8	0.8	---	---	None	---	None
		October	0.8	0.8	---	---	None	---	None
		November	0.6	0.8	---	---	None	---	None
Conic, very stony, skeletal----	B	Jan-Dec	---	---	---	---	None	---	None
Spooner, till/bedrock substratum	C/D	January	1.2	1.4	---	---	None	---	None
		February	1.2	1.4	---	---	None	---	None
		March	0.6	1.4	---	---	None	---	None
		April	0.2	1.4	---	---	None	---	None
		May	0.2	1.4	---	---	None	---	None
		June	0.3	1.4	---	---	None	---	None
		July	0.5	1.4	---	---	None	---	None
		August	0.6	1.4	---	---	None	---	None
		September	0.6	1.4	---	---	None	---	None
		October	0.5	1.4	---	---	None	---	None
		November	0.3	1.4	---	---	None	---	None
		December	0.6	1.4	---	---	None	---	None
Brickton-----	C/D	January	1.2	>2.0	---	---	None	---	None
		February	1.4	>2.0	---	---	None	---	None
		March	1.2	>2.0	---	---	None	---	None
		April	0.0	>2.0	---	---	None	---	None
		May	0.2	>2.0	---	---	None	---	None
		June	0.5	>2.0	---	---	None	---	None
		July	0.8	>2.0	---	---	None	---	None
		August	1.1	>2.0	---	---	None	---	None
		September	1.4	>2.0	---	---	None	---	None
		October	1.1	>2.0	---	---	None	---	None
		November	0.6	>2.0	---	---	None	---	None
		December	1.1	>2.0	---	---	None	---	None
Dishno, very stony, skeletal----	B	April	0.6	1.3	---	---	None	---	None
		May	0.8	1.3	---	---	None	---	None
		June	0.8	1.3	---	---	None	---	None
		October	0.8	1.3	---	---	None	---	None
		November	0.6	1.3	---	---	None	---	None

Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srrr: Aquepts, very rubbly-----	B/D	January	0.5	>2.0	---	---	---	---	None
		February	0.6	>2.0	---	---	---	---	None
		March	0.2	>2.0	---	---	---	---	None
		April	0.0	>2.0	0.1-0.2	Long (7 to 30 days)	Frequent	---	None
		May	0.0	>2.0	0.1-0.2	Long (7 to 30 days)	Frequent	---	None
		June	0.0	>2.0	---	---	---	---	None
		July	0.1	>2.0	---	---	---	---	None
		August	0.3	>2.0	---	---	---	---	None
		September	0.4	>2.0	---	---	---	---	None
		October	0.1	>2.0	---	---	---	---	None
		November	0.0	>2.0	---	---	---	---	None
		December	0.2	>2.0	---	---	---	---	None
Aquepts, stony, moderately slow Ksat-----	C/D	January	0.3	>2.0	---	---	---	---	None
		February	0.5	>2.0	---	---	---	---	None
		March	0.2	>2.0	---	---	---	---	None
		April	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		May	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		June	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		July	0.2	>2.0	---	---	---	---	None
		August	0.3	>2.0	---	---	---	---	None
		September	0.5	>2.0	---	---	---	---	None
		October	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		November	0.0	>2.0	0.1-0.3	Long (7 to 30 days)	Frequent	---	None
		December	0.2	>2.0	---	---	---	---	None
Rock outcrop.									

Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srrt: Bowstring, frequently flooded---	A/D	January	0.2	>2.0	---	---	None	---	---
		February	0.2	>2.0	---	---	None	---	---
		March	0.0	>2.0	---	---	None	---	---
		April	0.0	>2.0	---	---	None	Long (7 to 30 days)	Frequent
		May	0.0	>2.0	---	---	None	Long (7 to 30 days)	Frequent
		June	0.0	>2.0	---	---	None	Long (7 to 30 days)	Frequent
		July	0.0	>2.0	---	---	None	---	---
		August	0.0	>2.0	---	---	None	---	---
		September	0.2	>2.0	---	---	None	---	---
		October	0.2	>2.0	---	---	None	---	---
		November	0.2	>2.0	---	---	None	---	---
		December	0.2	>2.0	---	---	None	---	---
Fluvaquents, frequently flooded	B/D	January	0.2	>2.0	---	---	None	---	---
		February	0.2	>2.0	---	---	None	---	---
		March	0.0	>2.0	---	---	None	---	---
		April	0.0	>2.0	---	---	None	Long (7 to 30 days)	Frequent
		May	0.0	>2.0	---	---	None	Long (7 to 30 days)	Frequent
		June	0.0	>2.0	---	---	None	Long (7 to 30 days)	Frequent
		July	0.0	>2.0	---	---	None	---	---
		August	0.0	>2.0	---	---	None	---	---
		September	0.2	>2.0	---	---	None	---	---
		October	0.2	>2.0	---	---	None	---	---
		November	0.2	>2.0	---	---	None	---	---
		December	0.2	>2.0	---	---	None	---	---

Table 21.-Water Features-Continued

Map symbol and soil name	Hydro- logic group	Month	Water table		Ponding			Flooding	
			Upper limit	Lower limit	Surface water depth	Duration	Frequency	Duration	Frequency
			m	m	m				
2srst: Cathro, frequently flooded-----	C/D	January	0.2	>2.0	---	---	None	---	---
		February	0.2	>2.0	---	---	None	---	---
		March	0.0	>2.0	---	---	None	---	---
		April	0.0	>2.0	---	---	None	Long (7 to 30 days)	Frequent
		May	0.0	>2.0	---	---	None	Long (7 to 30 days)	Frequent
		June	0.0	>2.0	---	---	None	Long (7 to 30 days)	Frequent
		July	0.0	>2.0	---	---	None	---	---
		August	0.0	>2.0	---	---	None	---	---
		September	0.2	>2.0	---	---	None	---	---
		October	0.2	>2.0	---	---	None	---	---
		November	0.2	>2.0	---	---	None	---	---
		December	0.2	>2.0	---	---	None	---	---
W. Water									

# Soil Survey of Voyageurs National Park, Minnesota

Table 22.—Chemical Properties of the Soils

(Absence of an entry indicates that data were not estimated)

Map symbol and soil name	Depth	Cation- exchange capacity	Effective cation- exchange capacity	Soil reaction	Calcium carbon- ate	Gypsum	Salinity	Sodium adsorp- tion ratio
	<u>Cm</u>	<u>meq/100 g</u>	<u>meq/100 g</u>	<u>pH</u>	<u>Pct</u>	<u>Pct</u>	<u>mmhos/cm</u>	
2srmd:								
Quetico, bouldery----	0-1	---	23.1-69.8	4.1-5.5	0	0	0.0-2.0	0
	1-5	---	5.2-14.3	4.5-6.0	0	0	0.0-2.0	0
	5-20	---	3.1-8.2	5.1-6.5	0	0	0.0-2.0	0
	20-200	---	---	---	---	---	---	---
Insula, bouldery-----	0-4	---	23.1-69.8	4.1-5.5	0	0	0.0-2.0	0
	4-10	---	5.2-14.3	4.5-6.0	0	0	0.0-2.0	0
	10-18	---	3.1-8.9	4.5-6.0	0	0	0.0-2.0	0
	18-29	---	2.6-8.2	4.5-6.0	0	0	0.0-2.0	0
	29-200	---	---	---	---	---	---	---
Rock outcrop.								
Wahlsten, bouldery, skeletal-----	0-5	---	23.1-69.8	4.1-5.5	0	0	0.0-2.0	0
	5-8	---	5.2-23.4	4.5-6.0	0	0	0.0-2.0	0
	8-28	---	3.1-8.9	4.5-6.0	0	0	0.0-2.0	0
	28-69	---	1.5-5.5	5.1-6.5	0	0	0.0-2.0	0
	69-94	1.1-7.7	---	5.1-6.5	0	0	0.0-2.0	0
	94-200	---	---	---	---	---	---	---
Conic, bouldery, skeletal-----	0-3	---	23.1-69.8	4.1-5.5	0	0	0.0-2.0	0
	3-7	---	5.2-23.4	4.5-6.0	0	0	0.0-2.0	0
	7-14	---	3.1-8.9	4.5-6.0	0	0	0.0-2.0	0
	14-26	---	1.5-5.5	5.1-6.5	0	0	0.0-2.0	0
	26-62	2.0-8.5	---	5.1-6.5	0	0	0.0-2.0	0
	62-200	---	---	---	---	---	---	---
Arcadian, very stony	0-6	---	23.1-69.8	4.1-5.5	0	0	0.0-2.0	0
	6-7	---	4.2-25.9	4.5-5.3	0	0	0.0-2.0	0
	7-14	---	1.6-13.8	4.3-5.2	0	0	0.0-2.0	0
	14-21	---	1.4-13.2	4.3-5.2	0	0	0.0-2.0	0
	21-41	---	0.2-8.7	5.0-6.0	0	0	0.0-2.0	0
	41-200	---	---	---	---	---	---	---
2srqm:								
Quetico, bouldery----	0-1	---	23.1-69.8	4.1-5.5	0	0	0.0-2.0	0
	1-5	---	5.2-14.3	4.5-6.0	0	0	0.0-2.0	0
	5-20	---	3.1-8.2	5.1-6.5	0	0	0.0-2.0	0
	20-200	---	---	---	---	---	---	---
Insula, bouldery-----	0-4	---	23.1-69.8	4.1-5.5	0	0	0.0-2.0	0
	4-10	---	5.2-14.3	4.5-6.0	0	0	0.0-2.0	0
	10-18	---	3.1-8.9	4.5-6.0	0	0	0.0-2.0	0
	18-29	---	2.6-8.2	4.5-6.0	0	0	0.0-2.0	0
	29-200	---	---	---	---	---	---	---
Rock outcrop.								
Conic, bouldery, skeletal-----	0-3	---	23.1-69.8	4.1-5.5	0	0	0.0-2.0	0
	3-7	---	5.2-23.4	4.5-6.0	0	0	0.0-2.0	0
	7-14	---	3.1-8.9	4.5-6.0	0	0	0.0-2.0	0
	14-26	---	1.5-5.5	5.1-6.5	0	0	0.0-2.0	0
	26-62	2.0-8.5	---	5.1-6.5	0	0	0.0-2.0	0
	62-200	---	---	---	---	---	---	---



# Soil Survey of Voyageurs National Park, Minnesota

Table 22.—Chemical Properties of the Soils—Continued

Map symbol and soil name	Depth	Cation- exchange capacity	Effective cation- exchange capacity	Soil reaction	Calcium carbon- ate	Gypsum	Salinity	Sodium adsorp- tion ratio
	Cm	meq/100 g	meq/100 g	pH	Pct	Pct	mmhos/cm	
2srqm:								
Arcadian, very stony	0-6	---	23.1-69.8	4.1-5.5	0	0	0.0-2.0	0
	6-7	---	4.2-25.9	4.5-5.3	0	0	0.0-2.0	0
	7-14	---	1.6-13.8	4.3-5.2	0	0	0.0-2.0	0
	14-21	---	1.4-13.2	4.3-5.2	0	0	0.0-2.0	0
	21-41	---	0.2-8.7	5.0-6.0	0	0	0.0-2.0	0
	41-200	---	---	---	---	---	---	---
2srqn:								
Insula, very bouldery, skeletal--	0-10	---	23.1-69.8	4.1-5.5	0	0	0	0
	10-18	---	1.9-25.9	4.5-5.5	0	0	0	0
	18-40	---	1.3-10.2	4.3-5.5	0	0	0	0
	40-200	---	---	---	---	---	---	---
Conic, very bouldery, skeletal--	0-7	---	4.2-26.8	4.5-5.5	0	0	0	0
	7-14	---	2.2-10.2	4.3-5.5	0	0	0	0
	14-26	---	1.5-8.7	4.9-5.5	0	0	0	0
	26-62	---	0.7-8.7	4.9-6.0	0	0	0	0
	62-200	---	---	---	---	---	---	---
Rock outcrop.								
Metonga, very stony, skeletal-----	0-10	---	4.2-25.9	4.5-5.3	0	0	0	0
	10-12	---	1.6-15.4	4.3-5.2	0	0	0	0
	12-41	---	1.4-13.2	4.3-5.2	0	0	0	0
	41-61	---	0.2-8.7	5.0-6.0	0	0	0	0
	61-200	---	---	---	---	---	---	---
Quetico, very bouldery, skeletal--	0-5	---	1.9-25.9	4.5-5.5	0	0	0	0
	5-12	---	1.1-10.2	4.3-5.5	0	0	0	0
	12-200	---	---	---	---	---	---	---
Wahlsten, very stony	0-9	---	5.0-26.8	4.5-5.3	0	0	0	0
	9-22	---	2.8-10.0	4.3-5.2	0	0	0	0
	22-78	---	0.2-8.7	4.9-5.6	0	0	0	0
	78-200	---	---	---	---	---	---	---
Voyageurs-----	0-7	---	7.9-16.0	4.6-5.3	0	0	0	0
	7-17	---	6.2-35.3	5.3-5.8	0	0	0	0
	17-30	---	9.9-25.3	4.8-6.6	0	0	0	0
	30-70	18.4-33.1	---	5.6-8.0	0	0	0	0
	70-140	2.0-12.3	---	5.6-8.0	0	0	0	0
	140-200	---	---	---	---	---	---	---
Aquepts, very rubbly	0-10	---	3.8-14.3	4.5-6.0	0	0	0	0
	10-28	---	1.0-7.8	4.5-6.0	0	0	0	0
	28-102	---	0.9-5.8	4.5-6.0	0	0	0	0
	102-200	1.2-6.8	---	5.1-6.5	0	0	0	0
2srqp:								
Quetico, very bouldery, skeletal--	0-5	---	1.9-25.9	4.5-5.5	0	0	0	0
	5-12	---	1.1-10.2	4.3-5.5	0	0	0	0
	12-200	---	---	---	---	---	---	---

# Soil Survey of Voyageurs National Park, Minnesota

Table 22.—Chemical Properties of the Soils—Continued

Map symbol and soil name	Depth	Cation- exchange capacity	Effective cation- exchange capacity	Soil reaction	Calcium carbon- ate	Gypsum	Salinity	Sodium adsorp- tion ratio
	Cm	meq/100 g	meq/100 g	pH	Pct	Pct	mmhos/cm	
2srqp: Insula, very bouldery, skeletal--	0-10	---	23.1-69.8	4.1-5.5	0	0	0	0
	10-18	---	1.9-25.9	4.5-5.5	0	0	0	0
	18-40	---	1.3-10.2	4.3-5.5	0	0	0	0
	40-200	---	---	---	---	---	---	---
Greenwood-----	0-20	---	24.9-46.8	3.5-4.5	0	0	0	0
	20-200	---	21.9-46.8	3.5-4.5	0	0	0	0
Rock outcrop.								
Merwin-----	0-25	---	24.9-46.8	3.5-4.5	0	0	0	0
	25-60	---	21.9-46.8	3.5-4.5	0	0	0	0
	60-64	---	17.3-50.0	4.6-5.3	0	0	0	0
	64-200	---	4.3-16.0	4.8-6.6	0	0	0	0
Aquepts, very rubbly	0-10	---	3.8-14.3	4.5-6.0	0	0	0	0
	10-28	---	1.0-7.8	4.5-6.0	0	0	0	0
	28-102	---	0.9-5.8	4.5-6.0	0	0	0	0
	102-200	1.2-6.8	---	5.1-6.5	0	0	0	0
Wahlsten, very stony	0-9	---	5.0-26.8	4.5-5.3	0	0	0	0
	9-22	---	2.8-10.0	4.3-5.2	0	0	0	0
	22-78	---	0.2-8.7	4.9-5.6	0	0	0	0
	78-200	---	---	---	---	---	---	---
Conic, very bouldery, skeletal--	0-7	---	4.2-26.8	4.5-5.5	0	0	0	0
	7-14	---	2.2-10.2	4.3-5.5	0	0	0	0
	14-26	---	1.5-8.7	4.9-5.5	0	0	0	0
	26-62	---	0.7-8.7	4.9-6.0	0	0	0	0
	62-200	---	---	---	---	---	---	---
2srqr: Greenwood-----	0-20	---	24.9-46.8	3.5-4.5	0	0	0	0
	20-200	---	21.9-46.8	3.5-4.5	0	0	0	0
Merwin-----	0-25	---	24.9-46.8	3.5-4.5	0	0	0	0
	25-60	---	21.9-46.8	3.5-4.5	0	0	0	0
	60-64	---	17.3-50.0	4.6-5.3	0	0	0	0
	64-200	---	4.3-16.0	4.8-6.6	0	0	0	0
Rifle, moat-----	0-125	---	38.2-142.2	4.5-6.5	0	0	0	0
	125-135	---	22.4-126.9	4.5-6.5	0	0	0	0
	135-200	---	9.1-15.5	4.8-6.6	0	0	0	0
Tacoosh, moat-----	0-25	---	43.4-107.7	4.5-6.0	0	0	0	0
	25-125	---	38.2-107.7	4.5-6.0	0	0	0	0
	125-135	---	17.3-50.0	5.1-6.5	0	0	0	0
	135-200	2.6-9.2	---	6.1-8.3	0-10	0	0	0
2srqs: Insula, very stony, skeletal-----	0-10	---	23.1-69.8	4.1-5.5	0	0	0	0
	10-18	---	1.9-25.9	4.5-5.5	0	0	0	0
	18-40	---	1.3-10.2	4.3-5.5	0	0	0	0
	40-200	---	---	---	---	---	---	---

# Soil Survey of Voyageurs National Park, Minnesota

Table 22.—Chemical Properties of the Soils—Continued

Map symbol and soil name	Depth	Cation- exchange capacity	Effective cation- exchange capacity	Soil reaction	Calcium carbon- ate	Gypsum	Salinity	Sodium adsorp- tion ratio
	<u>Cm</u>	<u>meq/100 g</u>	<u>meq/100 g</u>	<u>pH</u>	<u>Pct</u>	<u>Pct</u>	<u>mmhos/cm</u>	
2srqs:								
Conic, very stony, skeletal-----	0-7	---	4.2-26.8	4.5-5.5	0	0	0	0
	7-14	---	2.2-10.2	4.3-5.5	0	0	0	0
	14-26	---	1.5-8.7	4.9-5.5	0	0	0	0
	26-62	---	0.7-8.7	4.9-6.0	0	0	0	0
	62-200	---	---	---	---	---	---	---
Wahlsten, very stony	0-9	---	5.0-26.8	4.5-5.3	0	0	0	0
	9-22	---	2.8-10.0	4.3-5.2	0	0	0	0
	22-78	---	0.2-8.7	4.9-5.6	0	0	0	0
	78-200	---	---	---	---	---	---	---
Quetico, very stony, skeletal-----	0-5	---	1.9-25.9	4.5-5.5	0	0	0	0
	5-12	---	1.1-10.2	4.3-5.5	0	0	0	0
	12-200	---	---	---	---	---	---	---
Metonga, very stony, skeletal-----	0-10	---	4.2-25.9	4.5-5.3	0	0	0	0
	10-12	---	1.6-15.4	4.3-5.2	0	0	0	0
	12-41	---	1.4-13.2	4.3-5.2	0	0	0	0
	41-61	---	0.2-8.7	5.0-6.0	0	0	0	0
	61-200	---	---	---	---	---	---	---
Dishno, very stony, skeletal-----	0-9	---	4.2-25.9	4.5-5.3	0	0	0	0
	9-18	---	2.1-15.4	4.3-5.2	0	0	0	0
	18-37	---	1.5-12.1	4.3-5.2	0	0	0	0
	37-53	---	1.5-10.6	4.9-5.6	0	0	0	0
	53-114	---	0.2-7.8	5.0-6.0	0	0	0	0
	114-125	---	0.1-6.0	5.0-6.0	0	0	0	0
	125-200	---	---	---	---	---	---	---
Aquepts, very rubbly	0-10	---	3.8-14.3	4.5-6.0	0	0	0	0
	10-28	---	1.0-7.8	4.5-6.0	0	0	0	0
	28-102	---	0.9-5.8	4.5-6.0	0	0	0	0
	102-200	1.2-6.8	---	5.1-6.5	0	0	0	0
Aquepts, stony, moderately slow Ksat	0-18	---	2.6-22.5	4.6-5.3	0	0	0	0
	18-38	---	2.3-13.8	4.8-6.6	0	0	0	0
	38-98	10.3-25.6	---	5.6-7.8	0	0	0	0
	98-200	0.7-16.0	---	5.6-7.8	0	0	0	0
Voyageurs-----	0-7	---	7.9-16.0	4.6-5.3	0	0	0	0
	7-17	---	6.2-35.3	5.3-5.8	0	0	0	0
	17-30	---	9.9-25.3	4.8-6.6	0	0	0	0
	30-70	18.4-33.1	---	5.6-7.3	0	0	0	0
	70-140	2.0-12.3	---	5.6-7.8	0	0	0	0
	140-200	---	---	---	---	---	---	---
Rock outcrop.								
Foglake-----	0-18	---	30.6-81.5	4.1-5.5	0	0	0	0
	18-20	---	2.6-22.5	4.6-5.3	0	0	0	0
	20-38	---	8.3-21.8	4.8-6.6	0	0	0	0
	38-90	25.4-36.2	---	5.6-8.0	0	0	0	0
	90-100	17.6-26.0	---	5.6-8.3	0-10	0	0	0
	100-200	15.7-22.3	---	7.4-8.3	5-15	0	0	0

# Soil Survey of Voyageurs National Park, Minnesota

Table 22.—Chemical Properties of the Soils—Continued

Map symbol and soil name	Depth	Cation- exchange capacity	Effective cation- exchange capacity	Soil reaction	Calcium carbon- ate	Gypsum	Salinity	Sodium adsorp- tion ratio
	Cm	meq/100 g	meq/100 g	pH	Pct	Pct	mmhos/cm	
2srqs: Eaglesnest, very stony-----	0-6	---	4.5-26.4	4.5-6.0	0	0	0	0
	6-27	---	3.1-9.5	4.5-6.0	0	0	0	0
	27-79	---	1.5-5.3	5.1-6.5	0	0	0	0
	79-102	1.1-6.8	---	5.1-6.5	0	0	0	0
	102-200	1.1-3.5	---	5.1-6.5	0	0	0	0
2srqv: Voyageurs, oxyaquic--	0-5	---	28.8-121.6	4.5-6.5	0	0	0	0
	5-8	---	6.9-15.8	4.6-5.3	0	0	0	0
	8-22	---	7.2-27.3	5.3-5.8	0	0	0	0
	22-76	14.2-27.2	---	4.8-7.3	0	0	0	0
	76-87	10.3-22.5	---	5.6-7.8	0	0	0	0
	87-101	0.1-8.3	---	5.6-7.8	0	0	0	0
	101-200	---	---	---	---	---	---	---
Conic, very stony, skeletal-----	0-7	---	4.2-26.8	4.5-5.5	0	0	0	0
	7-14	---	2.2-10.2	4.3-5.5	0	0	0	0
	14-26	---	1.5-8.7	4.9-5.5	0	0	0	0
	26-62	---	0.7-8.7	4.9-6.0	0	0	0	0
	62-200	---	---	---	---	---	---	---
Little Swan-----	0-6	---	28.8-121.6	4.5-6.5	0	0	0	0
	6-16	---	8.5-15.8	4.6-5.3	0	0	0	0
	16-25	---	8.7-27.3	5.3-5.8	0	0	0	0
	25-63	---	9.2-17.8	4.8-6.6	0	0	0	0
	63-100	12.9-22.5	---	7.4-8.3	2-15	0	0	0
	100-200	12.9-22.5	---	7.4-8.3	2-10	0	0	0
Insula, very stony, skeletal-----	0-10	---	23.1-69.8	4.1-5.5	0	0	0	0
	10-18	---	1.9-25.9	4.5-5.5	0	0	0	0
	18-40	---	1.3-10.2	4.3-5.5	0	0	0	0
	40-200	---	---	---	---	---	---	---
Wahlsten, very stony	0-9	---	5.0-26.8	4.5-5.3	0	0	0	0
	9-22	---	2.8-10.0	4.3-5.2	0	0	0	0
	22-78	---	0.2-8.7	4.9-5.6	0	0	0	0
	78-200	---	---	---	---	---	---	---
Metonga, very stony, skeletal-----	0-10	---	4.2-25.9	4.5-5.3	0	0	0	0
	10-12	---	1.6-15.4	4.3-5.2	0	0	0	0
	12-41	---	1.4-13.2	4.3-5.2	0	0	0	0
	41-61	---	0.2-8.7	5.0-6.0	0	0	0	0
	61-200	---	---	---	---	---	---	---
Baudette-----	0-5	---	28.8-121.6	4.5-6.5	0	0	0	0
	5-8	---	8.5-15.8	4.6-5.3	0	0	0	0
	8-20	---	8.9-26.6	5.3-5.8	0	0	0	0
	20-35	---	9.2-15.4	4.8-6.6	0	0	0	0
	35-70	14.2-27.2	---	5.6-8.0	0	0	0	0
	70-90	12.9-23.3	---	6.6-8.0	0-15	0	0	0
	90-200	12.9-18.5	---	7.4-8.3	5-15	0	0	0

# Soil Survey of Voyageurs National Park, Minnesota

Table 22.—Chemical Properties of the Soils—Continued

Map symbol and soil name	Depth	Cation- exchange capacity	Effective cation- exchange capacity	Soil reaction	Calcium carbon- ate	Gypsum	Salinity	Sodium adsorp- tion ratio
	<u>Cm</u>	<u>meq/100 g</u>	<u>meq/100 g</u>	<u>pH</u>	<u>Pct</u>	<u>Pct</u>	<u>mmhos/cm</u>	
2srqv: Aquepts, stony, moderately slow Ksat	0-18	---	2.6-22.5	4.6-5.3	0	0	0	0
	18-38	---	2.3-13.8	4.8-6.6	0	0	0	0
	38-98	10.3-25.6	---	5.6-7.8	0	0	0	0
	98-200	0.7-16.0	---	5.6-7.8	0	0	0	0
Rock outcrop.								
2srqw: Wahlsten, very stony	0-9	---	5.0-26.8	4.5-5.3	0	0	0	0
	9-22	---	2.8-10.0	4.3-5.2	0	0	0	0
	22-78	---	0.2-8.7	4.9-5.6	0	0	0	0
	78-200	---	---	---	---	---	---	---
Spooner-----	0-15	---	2.6-22.5	4.6-5.3	0	0	0	0
	15-25	---	8.3-14.7	5.3-5.8	0	0	0	0
	25-40	---	6.4-22.7	4.8-6.6	0	0	0	0
	40-70	14.2-27.2	---	5.6-8.0	0	0	0	0
	70-100	12.9-20.1	---	7.4-8.3	5-15	0	0	0
	100-200	12.9-19.1	---	7.4-8.3	5-15	0	0	0
Voyageurs-----	0-7	---	7.9-16.0	4.6-5.3	0	0	0	0
	7-17	---	6.2-35.3	5.3-5.8	0	0	0	0
	17-30	---	9.9-25.3	4.8-6.6	0	0	0	0
	30-70	18.4-33.1	---	5.6-8.0	0	0	0	0
	70-140	2.0-12.3	---	5.6-8.0	0	0	0	0
	140-200	---	---	---	---	---	---	---
Insula, very stony, skeletal-----	0-10	---	23.1-69.8	4.1-5.5	0	0	0	0
	10-18	---	1.9-25.9	4.5-5.5	0	0	0	0
	18-40	---	1.3-10.2	4.3-5.5	0	0	0	0
	40-200	---	---	---	---	---	---	---
Dishno, very stony, skeletal-----	0-9	---	4.2-25.9	4.5-5.3	0	0	0	0
	9-18	---	2.1-15.4	4.3-5.2	0	0	0	0
	18-37	---	1.5-12.1	4.3-5.2	0	0	0	0
	37-53	---	1.5-10.6	4.9-5.6	0	0	0	0
	53-114	---	0.2-7.8	5.0-6.0	0	0	0	0
	114-125	---	0.1-6.0	5.0-6.0	0	0	0	0
	125-200	---	---	---	---	---	---	---
Aquepts, stony, moderately slow Ksat	0-18	---	2.6-22.5	4.6-5.3	0	0	0	0
	18-38	---	2.3-13.8	4.8-6.6	0	0	0	0
	38-98	10.3-25.6	---	5.6-7.8	0	0	0	0
	98-200	0.7-16.0	---	5.6-7.8	0	0	0	0
Little Swan-----	0-6	---	28.8-121.6	4.5-6.5	0	0	0	0
	6-16	---	8.5-15.8	4.6-5.3	0	0	0	0
	16-25	---	8.7-27.3	5.3-5.8	0	0	0	0
	25-63	---	9.2-17.8	4.8-6.6	0	0	0	0
	63-100	12.9-22.5	---	7.4-8.3	2-15	0	0	0
	100-200	12.9-22.5	---	7.4-8.3	2-10	0	0	0

# Soil Survey of Voyageurs National Park, Minnesota

Table 22.—Chemical Properties of the Soils—Continued

Map symbol and soil name	Depth	Cation- exchange capacity	Effective cation- exchange capacity	Soil reaction	Calcium carbon- ate	Gypsum	Salinity	Sodium adsorp- tion ratio
	Cm	meq/100 g	meq/100 g	pH	Pct	Pct	mmhos/cm	
2srqw:								
Aquepts, very rubbly	0-10	---	3.8-14.3	4.5-6.0	0	0	0	0
	10-28	---	1.0-7.8	4.5-6.0	0	0	0	0
	28-102	---	0.9-5.8	4.5-6.0	0	0	0	0
	102-200	1.2-6.8	---	5.1-6.5	0	0	0	0
Rock outcrop.								
2srqy:								
Baudette-----	0-5	---	28.8-121.6	4.5-6.5	0	0	0	0
	5-8	---	8.5-15.8	4.6-5.3	0	0	0	0
	8-20	---	8.9-26.6	5.3-5.8	0	0	0	0
	20-35	---	9.2-15.4	4.8-6.6	0	0	0	0
	35-70	14.2-27.2	---	5.6-8.0	0	0	0	0
	70-90	12.9-23.3	---	6.6-8.0	0-15	0	0	0
	90-200	12.9-18.5	---	7.4-8.3	5-15	0	0	0
Little Swan-----	0-6	---	28.8-121.6	4.5-6.5	0	0	0	0
	6-16	---	8.5-15.8	4.6-5.3	0	0	0	0
	16-25	---	8.7-27.3	5.3-5.8	0	0	0	0
	25-63	---	9.2-17.8	4.8-6.6	0	0	0	0
	63-100	12.9-22.5	---	7.4-8.3	2-15	0	0	0
	100-200	12.9-22.5	---	7.4-8.3	2-10	0	0	0
Voyageurs-----	0-7	---	7.9-16.0	4.6-5.3	0	0	0	0
	7-17	---	6.2-35.3	5.3-5.8	0	0	0	0
	17-30	---	9.9-25.3	4.8-6.6	0	0	0	0
	30-70	18.4-33.1	---	5.6-8.0	0	0	0	0
	70-140	2.0-12.3	---	5.6-8.0	0	0	0	0
	140-200	---	---	---	---	---	---	---
Wahlsten, very stony	0-9	---	5.0-26.8	4.5-5.3	0	0	0	0
	9-22	---	2.8-10.0	4.3-5.2	0	0	0	0
	22-78	---	0.2-8.7	4.9-5.6	0	0	0	0
	78-200	---	---	---	---	---	---	---
Insula, very stony, skeletal-----	0-10	---	23.1-69.8	4.1-5.5	0	0	0	0
	10-18	---	1.9-25.9	4.5-5.5	0	0	0	0
	18-40	---	1.3-10.2	4.3-5.5	0	0	0	0
	40-200	---	---	---	---	---	---	---
Spooner-----	0-15	---	2.6-22.5	4.6-5.3	0	0	0	0
	15-25	---	8.3-14.7	5.3-5.8	0	0	0	0
	25-40	---	6.4-22.7	4.8-6.6	0	0	0	0
	40-70	14.2-27.2	---	5.6-8.0	0	0	0	0
	70-100	12.9-20.1	---	7.4-8.3	5-15	0	0	0
	100-200	12.9-19.1	---	7.4-8.3	5-15	0	0	0
2srqz:								
Canthook-----	0-2	---	18.0-63.5	4.1-5.5	0	0	0	0
	2-12	---	3.1-10.9	4.5-5.3	0	0	0	0
	12-29	---	0.2-14.6	5.3-5.8	0	0	0	0
	29-43	15.6-30.7	---	5.6-7.3	0	0	0	0
	43-61	16.7-29.1	---	5.6-7.3	0	0	0	0
	61-91	16.7-29.1	---	5.6-8.0	0-5	0	0	0
	91-200	16.7-25.8	---	7.4-8.3	5-15	0	0	0

# Soil Survey of Voyageurs National Park, Minnesota

Table 22.—Chemical Properties of the Soils—Continued

Map symbol and soil name	Depth	Cation- exchange capacity	Effective cation- exchange capacity	Soil reaction	Calcium carbon- ate	Gypsum	Salinity	Sodium adsorp- tion ratio
	Cm	meq/100 g	meq/100 g	pH	Pct	Pct	mmhos/cm	
2srqz:								
Durkeelake-----	0-8	---	0.8-5.5	4.5-5.3	0	0	0	0
	8-18	---	0.4-4.6	4.3-5.2	0	0	0	0
	18-60	---	0.4-5.1	4.9-5.6	0	0	0	0
	60-85	10.5-21.2	---	5.6-8.0	0	0	0	0
	85-200	12.6-25.9	---	7.4-8.3	5-10	0	0	0
Bootleg-----	0-9	---	30.6-81.5	4.1-5.5	0	0	0	0
	9-15	---	3.1-12.0	4.5-5.3	0	0	0	0
	15-27	---	1.3-8.6	4.9-5.6	0	0	0	0
	27-57	---	1.2-8.2	4.9-5.6	0	0	0	0
	57-137	25.8-40.9	---	5.6-8.0	0	0	0	0
	137-200	16.7-25.8	---	7.4-8.3	5-15	0	0	0
Udipsamments-----	0-7	---	0.1-7.1	4.5-6.0	0	0	0	0
	7-9	---	0.0-4.5	4.5-6.0	0	0	0	0
	9-40	---	0.0-2.2	4.5-6.0	0	0	0	0
	40-72	0.1-5.6	---	5.1-6.5	0	0	0	0
	72-113	0.1-5.6	---	5.1-6.5	0	0	0	0
	113-200	0.1-3.1	---	5.1-6.5	0	0	0	0
Grytal-----	0-6	---	18.0-63.5	4.1-5.5	0	0	0	0
	6-11	---	0.0-7.0	4.5-6.0	0	0	0	0
	11-33	---	0.1-3.6	4.5-6.0	0	0	0	0
	33-104	0.1-5.5	---	5.1-6.5	0	0	0	0
	104-200	0.1-2.6	---	5.1-6.5	0	0	0	0
Voyageurs-----	0-7	---	7.9-16.0	4.6-5.3	0	0	0	0
	7-17	---	6.2-35.3	5.3-5.8	0	0	0	0
	17-30	---	9.9-25.3	4.8-6.6	0	0	0	0
	30-70	18.4-33.1	---	5.6-8.0	0	0	0	0
	70-140	2.0-12.3	---	5.6-8.0	0	0	0	0
	140-200	---	---	---	---	---	---	---
Aquepts, stony, moderately slow Ksat	0-18	---	2.6-22.5	4.6-5.3	0	0	0	0
	18-38	---	2.3-13.8	4.8-6.6	0	0	0	0
	38-98	10.3-25.6	---	5.6-7.8	0	0	0	0
	98-200	0.7-16.0	---	5.6-7.8	0	0	0	0
2srr3:								
Spooner-----	0-15	---	2.6-22.5	4.6-5.3	0	0	0	0
	15-25	---	8.3-14.7	5.3-5.8	0	0	0	0
	25-40	---	6.4-22.7	4.8-6.6	0	0	0	0
	40-70	14.2-27.2	---	5.6-8.0	0	0	0	0
	70-100	12.9-20.1	---	7.4-8.3	5-15	0	0	0
	100-200	12.9-19.1	---	7.4-8.3	5-15	0	0	0
Sax-----	0-21	83.4-159.0	---	5.1-6.5	0	0	0	0
	21-31	27.9-52.8	---	5.6-7.3	0	0	0	0
	31-93	14.2-23.7	---	5.6-8.0	0-10	0	0	0
	93-200	10.9-22.5	---	7.4-8.3	5-10	0	0	0
Spooner, till/bedrock substratum-----	0-4	---	30.6-81.5	4.1-5.5	0	0	0	0
	4-14	---	8.5-15.8	4.6-5.3	0	0	0	0
	14-35	---	6.1-38.8	4.8-6.6	0	0	0	0
	35-70	18.4-30.7	---	5.6-7.3	0	0	0	0
	70-107	1.8-8.3	---	5.6-7.8	0	0	0	0
	107-200	---	---	---	---	---	---	---

# Soil Survey of Voyageurs National Park, Minnesota

Table 22.—Chemical Properties of the Soils—Continued

Map symbol and soil name	Depth	Cation- exchange capacity	Effective cation- exchange capacity	Soil reaction	Calcium carbon- ate	Gypsum	Salinity	Sodium adsorp- tion ratio
	Cm	meq/100 g	meq/100 g	pH	Pct	Pct	mmhos/cm	
<b>2srr3:</b>								
Foglake-----	0-18	---	30.6-81.5	4.1-5.5	0	0	0	0
	18-20	---	2.6-22.5	4.6-5.3	0	0	0	0
	20-38	---	8.3-21.8	4.8-6.6	0	0	0	0
	38-90	25.4-36.2	---	5.6-8.0	0	0	0	0
	90-100	17.6-26.0	---	5.6-8.3	0-10	0	0	0
	100-200	15.7-22.3	---	7.4-8.3	5-15	0	0	0
<b>Little Swan</b> -----	0-6	---	28.8-121.6	4.5-6.5	0	0	0	0
	6-16	---	8.5-15.8	4.6-5.3	0	0	0	0
	16-25	---	8.7-27.3	5.3-5.8	0	0	0	0
	25-63	---	9.2-17.8	4.8-6.6	0	0	0	0
	63-100	12.9-22.5	---	7.4-8.3	2-15	0	0	0
	100-200	12.9-22.5	---	7.4-8.3	2-10	0	0	0
<b>Bootleg</b> -----	0-9	---	30.6-81.5	4.1-5.5	0	0	0	0
	9-15	---	3.1-12.0	4.5-5.3	0	0	0	0
	15-27	---	1.3-8.6	4.9-5.6	0	0	0	0
	27-57	---	1.2-8.2	4.9-5.6	0	0	0	0
	57-137	25.8-40.9	---	5.6-8.0	0	0	0	0
	137-200	16.7-25.8	---	7.4-8.3	5-15	0	0	0
<b>Canthook</b> -----	0-2	---	18.0-63.5	4.1-5.5	0	0	0	0
	2-12	---	3.1-10.9	4.5-5.3	0	0	0	0
	12-29	---	0.2-14.6	5.3-5.8	0	0	0	0
	29-43	15.6-30.7	---	5.6-7.3	0	0	0	0
	43-61	16.7-29.1	---	5.6-7.3	0	0	0	0
	61-91	16.7-29.1	---	5.6-8.0	0-5	0	0	0
	91-200	16.7-25.8	---	7.4-8.3	5-15	0	0	0
<b>2srr4:</b>								
<b>Little Swan</b> -----	0-6	---	28.8-121.6	4.5-6.5	0	0	0	0
	6-16	---	8.5-15.8	4.6-5.3	0	0	0	0
	16-25	---	8.7-27.3	5.3-5.8	0	0	0	0
	25-63	---	9.2-17.8	4.8-6.6	0	0	0	0
	63-100	12.9-22.5	---	7.4-8.3	2-15	0	0	0
	100-200	12.9-22.5	---	7.4-8.3	2-10	0	0	0
<b>Spooner</b> -----	0-15	---	2.6-22.5	4.6-5.3	0	0	0	0
	15-25	---	8.3-14.7	5.3-5.8	0	0	0	0
	25-40	---	6.4-22.7	4.8-6.6	0	0	0	0
	40-70	14.2-27.2	---	5.6-8.0	0	0	0	0
	70-100	12.9-20.1	---	7.4-8.3	5-15	0	0	0
	100-200	12.9-19.1	---	7.4-8.3	5-15	0	0	0
<b>Voyageurs</b> -----	0-7	---	7.9-16.0	4.6-5.3	0	0	0	0
	7-17	---	6.2-35.3	5.3-5.8	0	0	0	0
	17-30	---	9.9-25.3	4.8-6.6	0	0	0	0
	30-70	18.4-33.1	---	5.6-8.0	0	0	0	0
	70-140	2.0-12.3	---	5.6-8.0	0	0	0	0
	140-200	---	---	---	---	---	---	---
<b>Spooner, till/bedrock substratum</b> -----	0-4	---	30.6-81.5	4.1-5.5	0	0	0	0
	4-14	---	8.5-15.8	4.6-5.3	0	0	0	0
	14-35	---	6.1-38.8	4.8-6.6	0	0	0	0
	35-70	18.4-30.7	---	5.6-7.3	0	0	0	0
	70-107	1.8-8.3	---	5.6-7.8	0	0	0	0
	107-200	---	---	---	---	---	---	---



# Soil Survey of Voyageurs National Park, Minnesota

Table 22.—Chemical Properties of the Soils—Continued

Map symbol and soil name	Depth	Cation- exchange capacity	Effective cation- exchange capacity	Soil reaction	Calcium carbon- ate	Gypsum	Salinity	Sodium adsorp- tion ratio
	Cm	meq/100 g	meq/100 g	pH	Pct	Pct	mmhos/cm	
2srr4:								
Sax-----	0-21	83.4-159.0	---	5.1-6.5	0	0	0	0
	21-31	27.9-52.8	---	5.6-7.3	0	0	0	0
	31-93	14.2-23.7	---	5.6-8.0	0-10	0	0	0
	93-200	10.9-22.5	---	7.4-8.3	5-10	0	0	0
Foglake-----	0-18	---	30.6-81.5	4.1-5.5	0	0	0	0
	18-20	---	2.6-22.5	4.6-5.3	0	0	0	0
	20-38	---	8.3-21.8	4.8-6.6	0	0	0	0
	38-90	25.4-36.2	---	5.6-8.0	0	0	0	0
	90-100	17.6-26.0	---	5.6-8.3	0-10	0	0	0
	100-200	15.7-22.3	---	7.4-8.3	5-15	0	0	0
Bootleg-----	0-9	---	30.6-81.5	4.1-5.5	0	0	0	0
	9-15	---	3.1-12.0	4.5-5.3	0	0	0	0
	15-27	---	1.3-8.6	4.9-5.6	0	0	0	0
	27-57	---	1.2-8.2	4.9-5.6	0	0	0	0
	57-137	25.8-40.9	---	5.6-8.0	0	0	0	0
	137-200	16.7-25.8	---	7.4-8.3	5-15	0	0	0
Canthook-----	0-2	---	18.0-63.5	4.1-5.5	0	0	0	0
	2-12	---	3.1-10.9	4.5-5.3	0	0	0	0
	12-29	---	0.2-14.6	5.3-5.8	0	0	0	0
	29-43	15.6-30.7	---	5.6-7.3	0	0	0	0
	43-61	16.7-29.1	---	5.6-7.3	0	0	0	0
	61-91	16.7-29.1	---	5.6-8.0	0-5	0	0	0
	91-200	16.7-25.8	---	7.4-8.3	5-15	0	0	0
2srr7:								
Mooselake-----	0-60	104.3-137.2	---	5.5-6.5	0	0	0	0
	60-120	104.3-137.2	---	5.5-6.5	0	0	0	0
	120-200	104.3-137.2	---	5.5-6.5	0	0	0	0
Tacoosh, moat-----	0-25	---	43.4-107.7	4.5-6.0	0	0	0	0
	25-125	---	38.2-107.7	4.5-6.0	0	0	0	0
	125-135	---	17.3-50.0	5.1-6.5	0	0	0	0
	135-200	2.6-9.2	---	6.1-8.3	0-10	0	0	0
Rifle-----	0-30	---	30.6-81.5	4.1-5.5	0	0	0	0
	30-200	---	38.2-142.2	4.5-6.5	0	0	0	0
Cathro, moat-----	0-14	---	38.2-142.2	4.5-6.5	0	0	0	0
	14-42	---	22.4-126.9	4.5-6.5	0	0	0	0
	42-48	27.9-56.0	---	5.1-6.5	0	0	0	0
	48-62	9.5-27.3	---	5.6-7.3	0	0	0	0
	62-200	2.6-9.2	---	6.1-8.3	0-10	0	0	0
2srr8:								
Rifle-----	0-25	---	30.6-81.5	4.1-5.5	0	0	0	0
	25-200	---	38.2-142.2	4.5-6.5	0	0	0	0
Tacoosh, moat-----	0-25	---	43.4-107.7	4.5-6.0	0	0	0	0
	25-125	---	38.2-107.7	4.5-6.0	0	0	0	0
	125-135	---	17.3-50.0	5.1-6.5	0	0	0	0
	135-200	2.6-9.2	---	6.1-8.3	0-10	0	0	0
Greenwood-----	0-20	---	24.9-46.8	3.5-4.5	0	0	0	0
	20-200	---	21.9-46.8	3.5-4.5	0	0	0	0

# Soil Survey of Voyageurs National Park, Minnesota

Table 22.—Chemical Properties of the Soils—Continued

Map symbol and soil name	Depth	Cation- exchange capacity	Effective cation- exchange capacity	Soil reaction	Calcium carbon- ate	Gypsum	Salinity	Sodium adsorp- tion ratio
	Cm	meq/100 g	meq/100 g	pH	Pct	Pct	mmhos/cm	
<b>2srr8:</b>								
Aquepts, stony, moderately slow Ksat	0-18	---	2.6-22.5	4.6-5.3	0	0	0	0
	18-38	---	2.3-13.8	4.8-6.6	0	0	0	0
	38-98	10.3-25.6	---	5.6-7.8	0	0	0	0
	98-200	0.7-16.0	---	5.6-7.8	0	0	0	0
<b>2srr9:</b>								
Tacoosh, frequently flooded-----	0-25	---	43.4-107.7	4.5-6.0	0	0	0	0
	25-125	---	38.2-107.7	4.5-6.0	0	0	0	0
	125-135	---	17.3-50.0	5.1-6.5	0	0	0	0
	135-200	2.6-9.2	---	6.1-8.3	0-10	0	0	0
Sax, frequently flooded-----	0-21	83.4-159.0	---	5.1-6.5	0	0	0	0
	21-31	27.9-52.8	---	5.6-7.3	0	0	0	0
	31-93	14.2-23.7	---	5.6-8.0	0-10	0	0	0
	93-200	10.9-22.5	---	7.4-8.3	5-10	0	0	0
Cathro, frequently flooded-----	0-14	---	38.2-142.2	4.5-6.5	0	0	0	0
	14-42	---	22.4-126.9	4.5-6.5	0	0	0	0
	42-48	27.9-56.0	---	5.1-6.5	0	0	0	0
	48-62	9.5-27.3	---	5.6-7.3	0	0	0	0
	62-200	2.6-9.2	---	6.1-8.3	0-10	0	0	0
Rifle, frequently flooded-----	0-125	---	38.2-142.2	4.5-6.5	0	0	0	0
	125-135	---	22.4-126.9	4.5-6.5	0	0	0	0
	135-200	---	9.1-15.5	4.8-6.6	0	0	0	0
Hassman, frequently flooded-----	0-19	---	5.7-22.5	4.6-5.3	0	0	0	0
	19-27	---	16.0-25.4	5.3-5.8	0	0	0	0
	27-46	25.4-42.4	---	5.6-8.0	0	0	0	0
	46-74	25.4-39.3	---	6.1-8.0	0-10	0	0	0
	74-152	25.4-33.1	---	6.9-8.3	0-10	0	0	0
	152-200	23.5-31.6	---	6.9-8.3	0-10	0	0	0
<b>2srrb:</b>								
Aquepts, ponded-----	0-2	---	38.2-142.2	4.5-6.5	0	0	0	0
	2-6	6.6-23.8	---	5.6-7.3	0	0	0	0
	6-25	5.4-20.6	---	6.1-7.3	0	0	0	0
	25-200	1.4-17.5	---	6.6-7.3	0	0	0	0
Sax, ponded-----	0-21	83.4-159.0	---	5.1-6.5	0	0	0	0
	21-31	27.9-52.8	---	5.6-7.3	0	0	0	0
	31-93	14.2-23.7	---	5.6-8.0	0-10	0	0	0
	93-200	10.9-22.5	---	7.4-8.3	5-10	0	0	0
Tacoosh, ponded-----	0-25	---	43.4-107.7	4.5-6.0	0	0	0	0
	25-125	---	38.2-107.7	4.5-6.0	0	0	0	0
	125-135	---	17.3-50.0	5.1-6.5	0	0	0	0
	135-200	2.6-9.2	---	6.1-8.3	0-10	0	0	0
Rifle, ponded-----	0-125	---	38.2-142.2	4.5-6.5	0	0	0	0
	125-135	---	22.4-126.9	4.5-6.5	0	0	0	0
	135-200	---	9.1-15.5	4.8-6.6	0	0	0	0

# Soil Survey of Voyageurs National Park, Minnesota

Table 22.—Chemical Properties of the Soils—Continued

Map symbol and soil name	Depth	Cation- exchange capacity	Effective cation- exchange capacity	Soil reaction	Calcium carbon- ate	Gypsum	Salinity	Sodium adsorp- tion ratio
	Cm	meq/100 g	meq/100 g	pH	Pct	Pct	mmhos/cm	
2srrb:								
Hassman, ponded-----	0-19	---	5.7-22.5	4.6-5.3	0	0	0	0
	19-27	---	16.0-25.4	5.3-5.8	0	0	0	0
	27-46	25.4-42.4	---	5.6-8.0	0	0	0	0
	46-74	25.4-39.3	---	6.1-8.0	0-10	0	0	0
	74-152	25.4-33.1	---	6.9-8.3	0-10	0	0	0
	152-200	23.5-31.6	---	6.9-8.3	0-10	0	0	0
2srrh:								
Greenwood, seasonally ponded---	0-20	---	24.9-46.8	3.5-4.5	0	0	0	0
	20-200	---	21.9-46.8	3.5-4.5	0	0	0	0
Merwin, seasonally ponded-----	0-25	---	24.9-46.8	3.5-4.5	0	0	0	0
	25-60	---	21.9-46.8	3.5-4.5	0	0	0	0
	60-64	---	17.3-50.0	4.6-5.3	0	0	0	0
	64-200	---	4.3-16.0	4.8-6.6	0	0	0	0
Rifle, seasonally ponded-----	0-30	---	30.6-81.5	4.1-5.5	0	0	0	0
	30-200	---	38.2-142.2	4.5-6.5	0	0	0	0
Tacoosh, seasonally ponded-----	0-25	---	43.4-107.7	4.5-6.0	0	0	0	0
	25-125	---	38.2-107.7	4.5-6.0	0	0	0	0
	125-135	---	17.3-50.0	5.1-6.5	0	0	0	0
	135-200	2.6-9.2	---	6.1-8.3	0-10	0	0	0
2srrj:								
Rifle, seasonally ponded-----	0-5	---	30.6-81.5	4.1-5.5	0	0	0	0
	5-140	---	38.2-142.2	4.5-6.5	0	0	0	0
	140-200	---	22.4-126.9	4.5-6.5	0	0	0	0
Tacoosh, seasonally ponded-----	0-25	---	43.4-107.7	4.5-6.0	0	0	0	0
	25-125	---	38.2-107.7	4.5-6.0	0	0	0	0
	125-135	---	17.3-50.0	5.1-6.5	0	0	0	0
	135-200	2.6-9.2	---	6.1-8.3	0-10	0	0	0
Greenwood, seasonally ponded---	0-20	---	24.9-46.8	3.5-4.5	0	0	0	0
	20-200	---	21.9-46.8	3.5-4.5	0	0	0	0
Aquepts, stony, moderately slow Ksat	0-18	---	2.6-22.5	4.6-5.3	0	0	0	0
	18-38	---	2.3-13.8	4.8-6.6	0	0	0	0
	38-98	10.3-25.6	---	5.6-7.8	0	0	0	0
	98-200	0.7-16.0	---	5.6-7.8	0	0	0	0
2srrk:								
Insula, very stony, skeletal-----	0-10	---	23.1-69.8	4.1-5.5	0	0	0	0
	10-18	---	1.9-25.9	4.5-5.5	0	0	0	0
	18-40	---	1.3-10.2	4.3-5.5	0	0	0	0
	40-200	---	---	---	---	---	---	---

Soil Survey of Voyageurs National Park, Minnesota

Table 22.—Chemical Properties of the Soils—Continued

Map symbol and soil name	Depth	Cation- exchange capacity	Effective cation- exchange capacity	Soil reaction	Calcium carbon- ate	Gypsum	Salinity	Sodium adsorp- tion ratio
	Cm	meq/100 g	meq/100 g	pH	Pct	Pct	mmhos/cm	
2srrk:								
Conic, very stony, skeletal-----	0-7	---	4.2-26.8	4.5-5.5	0	0	0	0
	7-14	---	2.2-10.2	4.3-5.5	0	0	0	0
	14-26	---	1.5-8.7	4.9-5.5	0	0	0	0
	26-62	---	0.7-8.7	4.9-6.0	0	0	0	0
	62-200	---	---	---	---	---	---	---
Wahlsten, very stony	0-9	---	5.0-26.8	4.5-5.3	0	0	0	0
	9-22	---	2.8-10.0	4.3-5.2	0	0	0	0
	22-78	---	0.2-8.7	4.9-5.6	0	0	0	0
	78-200	---	---	---	---	---	---	---
Quetico, very stony, skeletal-----	0-5	---	1.9-25.9	4.5-5.5	0	0	0	0
	5-12	---	1.1-10.2	4.3-5.5	0	0	0	0
	12-200	---	---	---	---	---	---	---
Metonga, very stony, skeletal-----	0-10	---	4.2-25.9	4.5-5.3	0	0	0	0
	10-12	---	1.6-15.4	4.3-5.2	0	0	0	0
	12-41	---	1.4-13.2	4.3-5.2	0	0	0	0
	41-61	---	0.2-8.7	5.0-6.0	0	0	0	0
	61-200	---	---	---	---	---	---	---
Dishno, very stony, skeletal-----	0-9	---	4.2-25.9	4.5-5.3	0	0	0	0
	9-18	---	2.1-15.4	4.3-5.2	0	0	0	0
	18-37	---	1.5-12.1	4.3-5.2	0	0	0	0
	37-53	---	1.5-10.6	4.9-5.6	0	0	0	0
	53-114	---	0.2-7.8	5.0-6.0	0	0	0	0
	114-125	---	0.1-6.0	5.0-6.0	0	0	0	0
	125-200	---	---	---	---	---	---	---
Aquepts, very rubbly	0-10	---	3.8-14.3	4.5-6.0	0	0	0	0
	10-28	---	1.0-7.8	4.5-6.0	0	0	0	0
	28-102	---	0.9-5.8	4.5-6.0	0	0	0	0
	102-200	1.2-6.8	---	5.1-6.5	0	0	0	0
Aquepts, stony, moderately slow Ksat	0-18	---	2.6-22.5	4.6-5.3	0	0	0	0
	18-38	---	2.3-13.8	4.8-6.6	0	0	0	0
	38-98	10.3-25.6	---	5.6-7.8	0	0	0	0
	98-200	0.7-16.0	---	5.6-7.8	0	0	0	0
Voyageurs-----	0-7	---	7.9-16.0	4.6-5.3	0	0	0	0
	7-17	---	6.2-35.3	5.3-5.8	0	0	0	0
	17-30	---	9.9-25.3	4.8-6.6	0	0	0	0
	30-70	18.4-33.1	---	5.6-8.0	0	0	0	0
	70-140	2.0-12.3	---	5.6-8.0	0	0	0	0
	140-200	---	---	---	---	---	---	---
Rock outcrop.								
Foglake-----	0-18	---	30.6-81.5	4.1-5.5	0	0	0	0
	18-20	---	2.6-22.5	4.6-5.3	0	0	0	0
	20-38	---	8.3-21.8	4.8-6.6	0	0	0	0
	38-90	25.4-36.2	---	5.6-8.0	0	0	0	0
	90-100	17.6-26.0	---	5.6-8.3	0-10	0	0	0
	100-200	15.7-22.3	---	7.4-8.3	5-15	0	0	0

# Soil Survey of Voyageurs National Park, Minnesota

Table 22.—Chemical Properties of the Soils—Continued

Map symbol and soil name	Depth	Cation- exchange capacity	Effective cation- exchange capacity	Soil reaction	Calcium carbon- ate	Gypsum	Salinity	Sodium adsorp- tion ratio
	Cm	meq/100 g	meq/100 g	pH	Pct	Pct	mmhos/cm	
2srrk: Eaglesnest, very stony-----	0-6	---	4.5-26.4	4.5-6.0	0	0	0	0
	6-27	---	3.1-9.5	4.5-6.0	0	0	0	0
	27-79	---	1.5-5.3	5.1-6.5	0	0	0	0
	79-102	1.1-6.8	---	5.1-6.5	0	0	0	0
	102-200	1.1-3.5	---	5.1-6.5	0	0	0	0
2srrl: Tacoosh, occasionally flooded	0-25	---	43.4-107.7	4.5-6.0	0	0	0	0
	25-125	---	38.2-107.7	4.5-6.0	0	0	0	0
	125-135	---	17.3-50.0	5.1-6.5	0	0	0	0
	135-200	2.6-9.2	---	6.1-8.3	0-10	0	0	0
Sax, occasionally flooded-----	0-21	83.4-159.0	---	5.1-6.5	0	0	0	0
	21-31	27.9-52.8	---	5.6-7.3	0	0	0	0
	31-93	14.2-23.7	---	5.6-8.0	0-10	0	0	0
	93-200	10.9-22.5	---	7.4-8.3	5-10	0	0	0
Cathro, occasionally flooded-----	0-14	---	38.2-142.2	4.5-6.5	0	0	0	0
	14-42	---	22.4-126.9	4.5-6.5	0	0	0	0
	42-48	27.9-56.0	---	5.1-6.5	0	0	0	0
	48-62	9.5-27.3	---	5.6-7.3	0	0	0	0
	62-200	2.6-9.2	---	6.1-8.3	0-10	0	0	0
Rifle, occasionally flooded-----	0-125	---	38.2-142.2	4.5-6.5	0	0	0	0
	125-135	---	22.4-126.9	4.5-6.5	0	0	0	0
	135-200	---	9.1-15.5	4.8-6.6	0	0	0	0
Hassman, occasionally flooded	0-19	---	5.7-22.5	4.6-5.3	0	0	0	0
	19-27	---	16.0-25.4	5.3-5.8	0	0	0	0
	27-46	25.4-42.4	---	5.6-8.0	0	0	0	0
	46-74	25.4-39.3	---	6.1-8.0	0-10	0	0	0
	74-152	25.4-33.1	---	6.9-8.3	0-10	0	0	0
	152-200	23.5-31.6	---	6.9-8.3	0-10	0	0	0
2srrm: Brickton-----	0-13	---	30.6-81.5	4.1-5.5	0	0	0	0
	13-20	---	7.5-15.7	4.3-5.2	0	0	0	0
	20-38	---	7.0-33.0	5.3-5.8	0	0	0	0
	38-125	25.4-42.4	---	5.6-8.0	0	0	0	0
	125-155	28.5-39.3	---	7.4-8.0	0-15	0	0	0
	155-200	26.3-37.5	---	7.1-8.3	0-15	0	0	0
Hassman-----	0-19	---	5.7-22.5	4.6-5.3	0	0	0	0
	19-27	---	16.0-25.4	5.3-5.8	0	0	0	0
	27-46	25.4-42.4	---	5.6-8.0	0	0	0	0
	46-74	25.4-39.3	---	6.1-8.0	0-10	0	0	0
	74-152	25.4-33.1	---	6.9-8.3	0-10	0	0	0
	152-200	23.5-31.6	---	6.9-8.3	0-10	0	0	0

# Soil Survey of Voyageurs National Park, Minnesota

Table 22.—Chemical Properties of the Soils—Continued

Map symbol and soil name	Depth	Cation- exchange capacity	Effective cation- exchange capacity	Soil reaction	Calcium carbon- ate	Gypsum	Salinity	Sodium adsorp- tion ratio
	Cm	meq/100 g	meq/100 g	pH	Pct	Pct	mmhos/cm	
2srrm: Spoonier, till/bedrock substratum-----	0-4	---	30.6-81.5	4.1-5.5	0	0	0	0
	4-14	---	8.5-15.8	4.6-5.3	0	0	0	0
	14-35	---	6.1-38.8	4.8-6.6	0	0	0	0
	35-70	18.4-30.7	---	5.6-7.3	0	0	0	0
	70-107	1.8-8.3	---	5.6-7.8	0	0	0	0
	107-200	---	---	---	---	---	---	---
Foglake-----	0-18	---	30.6-81.5	4.1-5.5	0	0	0	0
	18-20	---	2.6-22.5	4.6-5.3	0	0	0	0
	20-38	---	8.3-21.8	4.8-6.6	0	0	0	0
	38-90	25.4-36.2	---	5.6-8.0	0	0	0	0
	90-100	17.6-26.0	---	5.6-8.3	0-10	0	0	0
	100-200	15.7-22.3	---	7.4-8.3	5-15	0	0	0
Dalbo-----	0-18	---	7.9-16.0	4.6-5.3	0	0	0	0
	18-38	---	8.4-28.0	5.3-5.8	0	0	0	0
	38-69	---	18.7-42.5	4.8-6.6	0	0	0	0
	69-85	25.4-41.4	---	5.6-8.0	0	0	0	0
	85-118	20.5-37.5	---	7.4-8.0	0-15	0	0	0
	118-200	20.5-37.5	---	6.9-8.3	0-15	0	0	0
Bootleg-----	0-9	---	30.6-81.5	4.1-5.5	0	0	0	0
	9-15	---	3.1-12.0	4.5-5.3	0	0	0	0
	15-27	---	1.3-8.6	4.9-5.6	0	0	0	0
	27-57	---	1.2-8.2	4.9-5.6	0	0	0	0
	57-137	25.8-40.9	---	5.6-8.0	0	0	0	0
	137-200	16.7-25.8	---	7.4-8.3	5-15	0	0	0
Tacoosh-----	0-25	---	43.4-107.7	4.5-6.0	0	0	0	0
	25-125	---	38.2-107.7	4.5-6.0	0	0	0	0
	125-135	---	17.3-50.0	5.1-6.5	0	0	0	0
	135-200	2.6-9.2	---	6.1-8.3	0-10	0	0	0
2srrn: Brickton-----	0-13	---	30.6-81.5	4.1-5.5	0	0	0	0
	13-20	---	7.5-15.7	4.3-5.2	0	0	0	0
	20-38	---	7.0-33.0	5.3-5.8	0	0	0	0
	38-125	25.4-42.4	---	5.6-8.0	0	0	0	0
	125-155	28.5-39.3	---	7.4-8.0	0-15	0	0	0
	155-200	26.3-37.5	---	7.1-8.3	0-15	0	0	0
Dalbo-----	0-18	---	7.9-16.0	4.6-5.3	0	0	0	0
	18-38	---	8.4-28.0	5.3-5.8	0	0	0	0
	38-69	---	18.7-42.5	4.8-6.6	0	0	0	0
	69-85	25.4-41.4	---	5.6-8.0	0	0	0	0
	85-118	20.5-37.5	---	7.4-8.0	0-15	0	0	0
	118-200	20.5-37.5	---	6.9-8.3	0-15	0	0	0
Voyageurs-----	0-7	---	7.9-16.0	4.6-5.3	0	0	0	0
	7-17	---	6.2-35.3	5.3-5.8	0	0	0	0
	17-30	---	9.9-25.3	4.8-6.6	0	0	0	0
	30-70	18.4-33.1	---	5.6-8.0	0	0	0	0
	70-140	2.0-12.3	---	5.6-8.0	0	0	0	0
	140-200	---	---	---	---	---	---	---

# Soil Survey of Voyageurs National Park, Minnesota

Table 22.—Chemical Properties of the Soils—Continued

Map symbol and soil name	Depth	Cation- exchange capacity	Effective cation- exchange capacity	Soil reaction	Calcium carbon- ate	Gypsum	Salinity	Sodium adsorp- tion ratio
	Cm	meq/100 g	meq/100 g	pH	Pct	Pct	mmhos/cm	
2srrn:								
Foglake-----	0-18	---	30.6-81.5	4.1-5.5	0	0	0	0
	18-20	---	2.6-22.5	4.6-5.3	0	0	0	0
	20-38	---	8.3-21.8	4.8-6.6	0	0	0	0
	38-90	25.4-36.2	---	5.6-8.0	0	0	0	0
	90-100	17.6-26.0	---	5.6-8.3	0-10	0	0	0
	100-200	15.7-22.3	---	7.4-8.3	5-15	0	0	0
Spooner, till/bedrock substratum-----	0-4	---	30.6-81.5	4.1-5.5	0	0	0	0
	4-14	---	8.5-15.8	4.6-5.3	0	0	0	0
	14-35	---	6.1-38.8	4.8-6.6	0	0	0	0
	35-70	18.4-30.7	---	5.6-7.3	0	0	0	0
	70-107	1.8-8.3	---	5.6-7.8	0	0	0	0
	107-200	---	---	---	---	---	---	---
Bootleg-----	0-9	---	30.6-81.5	4.1-5.5	0	0	0	0
	9-15	---	3.1-12.0	4.5-5.3	0	0	0	0
	15-27	---	1.3-8.6	4.9-5.6	0	0	0	0
	27-57	---	1.2-8.2	4.9-5.6	0	0	0	0
	57-137	25.8-40.9	---	5.6-8.0	0	0	0	0
	137-200	16.7-25.8	---	7.4-8.3	5-15	0	0	0
Hassman-----	0-19	---	5.7-22.5	4.6-5.3	0	0	0	0
	19-27	---	16.0-25.4	5.3-5.8	0	0	0	0
	27-46	25.4-42.4	---	5.6-8.0	0	0	0	0
	46-74	25.4-39.3	---	6.1-8.0	0-10	0	0	0
	74-152	25.4-33.1	---	6.9-8.3	0-10	0	0	0
	152-200	23.5-31.6	---	6.9-8.3	0-10	0	0	0
2srrq:								
Cathro, ponded-----	0-14	---	38.2-142.2	4.5-6.5	0	0	0	0
	14-42	---	22.4-126.9	4.5-6.5	0	0	0	0
	42-48	27.9-56.0	---	5.1-6.5	0	0	0	0
	48-62	9.5-27.3	---	5.6-7.3	0	0	0	0
	62-200	2.6-9.2	---	6.1-8.3	0-10	0	0	0
Tacoosh, ponded-----	0-25	---	43.4-107.7	4.5-6.0	0	0	0	0
	25-125	---	38.2-107.7	4.5-6.0	0	0	0	0
	125-135	---	17.3-50.0	5.1-6.5	0	0	0	0
	135-200	2.6-9.2	---	6.1-8.3	0-10	0	0	0
Sax, ponded-----	0-21	83.4-159.0	---	5.1-6.5	0	0	0	0
	21-31	27.9-52.8	---	5.6-7.3	0	0	0	0
	31-93	14.2-23.7	---	5.6-8.0	0-10	0	0	0
	93-200	10.9-22.5	---	7.4-8.3	5-10	0	0	0
Aquepts, stony, moderately slow Ksat	0-18	---	2.6-22.5	4.6-5.3	0	0	0	0
	18-38	---	2.3-13.8	4.8-6.6	0	0	0	0
	38-98	10.3-25.6	---	5.6-7.8	0	0	0	0
	98-200	0.7-16.0	---	5.6-7.8	0	0	0	0

Soil Survey of Voyageurs National Park, Minnesota

Table 22.—Chemical Properties of the Soils—Continued

Map symbol and soil name	Depth	Cation- exchange capacity	Effective cation- exchange capacity	Soil reaction	Calcium carbon- ate	Gypsum	Salinity	Sodium adsorp- tion ratio
	Cm	meq/100 g	meq/100 g	pH	Pct	Pct	mmhos/cm	
2srrr:								
Insula, very stony, skeletal-----	0-10	---	23.1-69.8	4.1-5.5	0	0	0	0
	10-18	---	1.9-25.9	4.5-5.5	0	0	0	0
	18-40	---	1.3-10.2	4.3-5.5	0	0	0	0
	40-200	---	---	---	---	---	---	---
Voyageurs-----	0-7	---	7.9-16.0	4.6-5.3	0	0	0	0
	7-17	---	6.2-35.3	5.3-5.8	0	0	0	0
	17-30	---	9.9-25.3	4.8-6.6	0	0	0	0
	30-70	18.4-33.1	---	5.6-8.0	0	0	0	0
	70-140	2.0-12.3	---	5.6-8.0	0	0	0	0
	140-200	---	---	---	---	---	---	---
Wahlsten, very stony	0-9	---	5.0-26.8	4.5-5.3	0	0	0	0
	9-22	---	2.8-10.0	4.3-5.2	0	0	0	0
	22-78	---	0.2-8.7	4.9-5.6	0	0	0	0
	78-200	---	---	---	---	---	---	---
Conic, very stony, skeletal-----	0-7	---	4.2-26.8	4.5-5.5	0	0	0	0
	7-14	---	2.2-10.2	4.3-5.5	0	0	0	0
	14-26	---	1.5-8.7	4.9-5.5	0	0	0	0
	26-62	---	0.7-8.7	4.9-6.0	0	0	0	0
	62-200	---	---	---	---	---	---	---
Spooner, till/bedrock substratum-----	0-4	---	30.6-81.5	4.1-5.5	0	0	0	0
	4-14	---	8.5-15.8	4.6-5.3	0	0	0	0
	14-35	---	6.1-38.8	4.8-6.6	0	0	0	0
	35-70	18.4-30.7	---	5.6-7.3	0	0	0	0
	70-107	1.8-8.3	---	5.6-7.8	0	0	0	0
	107-200	---	---	---	---	---	---	---
Brickton-----	0-13	---	30.6-81.5	4.1-5.5	0	0	0	0
	13-20	---	7.5-15.7	4.3-5.2	0	0	0	0
	20-38	---	7.0-33.0	5.3-5.8	0	0	0	0
	38-125	25.4-42.4	---	5.6-8.0	0	0	0	0
	125-155	28.5-39.3	---	7.4-8.0	0-15	0	0	0
	155-200	26.3-37.5	---	7.1-8.3	0-15	0	0	0
Dishno, very stony, skeletal-----	0-9	---	4.2-25.9	4.5-5.3	0	0	0	0
	9-18	---	2.1-15.4	4.3-5.2	0	0	0	0
	18-37	---	1.5-12.1	4.3-5.2	0	0	0	0
	37-53	---	1.5-10.6	4.9-5.6	0	0	0	0
	53-114	---	0.2-7.8	5.0-6.0	0	0	0	0
	114-125	---	0.1-6.0	5.0-6.0	0	0	0	0
	125-200	---	---	---	---	---	---	---
Aquepts, very rubbly	0-10	---	3.8-14.3	4.5-6.0	0	0	0	0
	10-28	---	1.0-7.8	4.5-6.0	0	0	0	0
	28-102	---	0.9-5.8	4.5-6.0	0	0	0	0
	102-200	1.2-6.8	---	5.1-6.5	0	0	0	0



# Soil Survey of Voyageurs National Park, Minnesota

Table 22.—Chemical Properties of the Soils—Continued

Map symbol and soil name	Depth	Cation- exchange capacity	Effective cation- exchange capacity	Soil reaction	Calcium carbon- ate	Gypsum	Salinity	Sodium adsorp- tion ratio
	<u>Cm</u>	<u>meq/100 g</u>	<u>meq/100 g</u>	<u>pH</u>	<u>Pct</u>	<u>Pct</u>	<u>mmhos/cm</u>	
2srrr: Aquepts, stony, moderately slow Ksat	0-18	---	2.6-22.5	4.6-5.3	0	0	0	0
	18-38	---	2.3-13.8	4.8-6.6	0	0	0	0
	38-98	10.3-25.6	---	5.6-7.8	0	0	0	0
	98-200	0.7-16.0	---	5.6-7.8	0	0	0	0
Rock outcrop.								
2srtr: Bowstring, frequently flooded--	0-155	83.4-159.0	---	5.1-6.5	0	0	0	0
	155-156	0.8-18.4	---	5.6-7.3	0	0	0	0
	156-185	83.4-159.0	---	5.1-6.5	0	0	0	0
	185-200	1.5-8.8	---	5.6-7.3	0	0	0	0
Fluvaquents, frequently flooded--	0-15	---	30.6-81.5	4.1-5.5	0	0	0	0
	15-25	6.0-23.8	---	5.6-7.3	0	0	0	0
	25-40	4.2-17.5	---	6.1-7.3	0	0	0	0
	40-64	5.7-22.9	---	6.1-7.3	0	0	0	0
	64-200	1.4-16.3	---	6.1-7.8	0	0	0	0
Cathro, frequently flooded-----	0-14	---	38.2-142.2	4.5-6.5	0	0	0	0
	14-42	---	22.4-126.9	4.5-6.5	0	0	0	0
	42-48	27.9-56.0	---	5.1-6.5	0	0	0	0
	48-62	9.5-27.3	---	5.6-7.3	0	0	0	0
	62-200	2.6-9.2	---	6.1-8.3	0-10	0	0	0
W. Water								

# Soil Survey of Voyageurs National Park, Minnesota

Table 23.—Taxonomic Classification of the Soils

(An asterisk in the first column indicates a taxadjunct to the series. See text for a description of those characteristics that are outside the range of the series)

Soil name	Family or higher taxonomic class
Aquepts-----	Aquepts
Aquepts-----	Fine-loamy, nonacid, frigid Typic Endoaquepts
Aquepts-----	Loamy-skeletal, nonacid, frigid Typic Endoaquepts
Arcadian-----	Loamy-skeletal, mixed, active, frigid Lithic Haplorthods
Baudette-----	Fine-silty, mixed, superactive, frigid Oxyaquic Hapludalfs
Bootleg-----	Fine-loamy, mixed, superactive, frigid Typic Albaqualfs
Bowstring-----	Euic, frigid Fluvaquentic Haplosaprists
Brickton-----	Fine, smectitic, frigid Chromic Vertic Albaqualfs
Canthook-----	Fine-loamy, mixed, superactive, frigid Aeric Albaqualfs
Cathro-----	Loamy, mixed, euic, frigid Terric Haplosaprists
*Conic-----	Loamy-skeletal, isotic, frigid Typic Dystrudepts
Dalbo-----	Fine, smectitic, frigid Oxyaquic Vertic Hapludalfs
*Dishno-----	Coarse-loamy over sandy or sandy-skeletal, isotic, frigid Oxyaquic Haplorthods
*Durkeelake-----	Loamy, mixed, active, frigid Oxyaquic Hapludalfs
Eaglesnest-----	Loamy-skeletal, isotic, frigid Oxyaquic Dystrudepts
Fluvaquents-----	Fluvaquents
Foglake-----	Fine, smectitic, frigid Mollic Endoaqualfs
Greenwood-----	Dysic, frigid Typic Haplohemists
Grytal-----	Sandy, isotic, frigid Oxyaquic Eutrudepts
Hassman-----	Fine, smectitic, nonacid, frigid Vertic Endoaquepts
Insula-----	Loamy, isotic, frigid Lithic Dystrudepts
*Insula-----	Loamy-skeletal, isotic, frigid Lithic Dystrudepts
Littleswan-----	Fine-silty, mixed, superactive, frigid Aquollic Hapludalfs
Merwin-----	Loamy, mixed, dysic, frigid Terric Haplohemists
*Metonga-----	Loamy-skeletal, isotic, frigid Typic Haplorthods
Mooselake-----	Euic, frigid Typic Haplohemists
Quetico-----	Loamy, isotic, acid, frigid Lithic Udorthents
*Quetico-----	Loamy-skeletal, isotic, acid, frigid Lithic Udorthents
Rifle-----	Euic, frigid Typic Haplohemists
Sax-----	Fine-silty, mixed, superactive, nonacid, frigid Histic Humaquepts
Spooner-----	Fine-silty, mixed, superactive, frigid Mollic Endoaqualfs
*Spoonier-----	Fine-silty, mixed, superactive, frigid Mollic Endoaqualfs
Tacoosh-----	Loamy, mixed, euic, frigid Terric Haplohemists
Udipsamments-----	Udipsamments
Voyageurs-----	Fine, smectitic, frigid Aquic Glossudalfs
*Voyageurs-----	Fine, smectitic, frigid Oxyaquic Glossudalfs
Wahlsten-----	Coarse-loamy, isotic, frigid Oxyaquic Dystrudepts
*Wahlsten-----	Loamy-skeletal, isotic, frigid Oxyaquic Dystrudepts

# Appendices

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## Appendix 1—Official Soil Series Description – Voyageurs

LOCATION VOYAGEURS                      MN  
Tentative Series  
MDF  
04/2015  
VOYAGEURS SERIES

The Voyageurs series consists of deep, somewhat poorly drained soils that formed in silty lacustrine sediments overlying water-worked coarse loamy till overlying bedrock. These soils are on lacustrine-modified, bedrock-controlled till plains. Slope ranges from 0 to 6 percent. Mean annual precipitation is about 610 millimeters, and annual air temperature is about 3 degrees C.

TAXONOMIC CLASS: Fine, mixed, active, frigid Aquic Glossudalfs

TYPICAL PEDON: Voyageurs silt loam, on a north-facing, slightly concave slope of 2 percent, in a wooded area, at an elevation of 366 meters. (Colors are for moist soil unless otherwise stated.)

A--0 to 7 centimeters; black (10YR 2/1) silt loam, very dark gray (10YR 3/1) dry; weak medium granular structure; friable; many very fine to coarse roots throughout; about 1 percent gravel; pH 5.1-5.5; clear smooth boundary.

E--7 to 17 centimeters; light yellowish brown (2.5Y 6/3) silt loam, light gray (10YR 7/1) dry; weak medium subangular blocky structure; friable; many very fine to coarse roots throughout; about 1 percent gravel; pH 5.6-6.0; abrupt wavy boundary.

E/B--17 to 30 centimeters; 60 percent light yellowish brown (2.5Y 6/3), light gray (10YR 7/1) dry, silt loam (E); 40 percent olive brown (2.5Y 4/3), pale brown (10YR 6/3) dry, silty clay loam (Bt); moderate medium prismatic structure parting to strong fine to medium angular blocky; firm; common very fine to medium roots throughout; 1 percent faint dark brown (10YR 3/3) clay films on faces of peds; 2 percent fine prominent yellowish brown (10YR 5/6) masses of iron accumulation throughout; 1 percent fine faint light gray (2.5Y 7/2) iron depletions on faces of peds; about 1 percent gravel; pH 5.6-6.0; clear irregular boundary.

Bt--30 to 70 centimeters; olive brown (2.5Y 4/3) silty clay loam; moderate medium prismatic structure parting to strong fine to medium angular blocky; firm; common very fine and fine roots throughout; 1 percent faint dark brown (10YR 3/3) clay films on faces of peds; prominent dark brown (7.5YR 3/3) masses of iron accumulation throughout; 1 percent fine faint light gray (2.5Y 7/2) iron depletions on faces of peds; about 1 percent gravel; pH 6.6-7.3; gradual wavy boundary.

2C--70 to 140 centimeters; light olive brown (2.5Y 5/3) gravelly loamy sand; massive; very firm; common fine roots between peds; 2 percent fine prominent yellowish brown (10YR 5/6) masses of iron accumulation throughout; 1 percent fine faint light gray (2.5Y 7/2) iron depletions throughout; about 25 percent gravel, 10 percent cobbles, and 5 percent stones; pH 7.4-7.8; abrupt wavy boundary.

3R--140 to 203 centimeters; igneous bedrock.

TYPE LOCATION: Major Land Resource Area (MLRA) 93A—Superior Stony and Rocky Loamy Plains and Hills, Western Part, Voyageurs National Park, St. Louis County, Minnesota; about 5 miles north of Ash River, 1,680 feet north and 117 feet east of the southwest corner of section 12, T. 69 N., R. 20 W., USGS Ash River NE, Minnesota Quadrangle; latitude 48 degrees 28 minutes 27 seconds N. and longitude 92 degrees 51 minutes and 7 seconds W., NAD 83.

## Soil Survey of Voyageurs National Park, Minnesota

**RANGE IN CHARACTERISTICS:** Depth to till ranges from 50 to 102 centimeters. Depth to bedrock ranges from 102 to 150 centimeters. In the upper horizons, rock fragment content, by volume, ranges from 0 to 1 percent and fragments are dominantly gravel. In the lower, dense till layers, rock fragment content, by volume, ranges from 25 to 50 percent and fragments are equal parts gravel, cobbles, and stones. Fragments are predominantly Precambrian igneous and high-grade metamorphic rock of Laurentian Plateau origin. Depth to free calcium carbonates, if they occur, in the upper lithology ranges from 0 to 50 centimeters. The particle-size control section contains 35 to 60 percent clay.

Some pedons have an Oe or Oa horizon as much as 15 centimeters thick.

### A horizon:

Hue--10YR  
Value--2 to 3  
Chroma--1 to 2  
Texture--silt loam, loam, or very fine sandy loam  
Reaction--pH 5.1 to 7.3  
Thickness--0 to 15 centimeters

### E horizon:

Hue--2.5Y to 10YR  
Value--4 to 6  
Chroma--2 or 3  
Texture--silt loam or silty clay loam  
Reaction--pH 5.1 to 7.3  
Thickness--0 to 20 centimeters

### E/B horizon:

Color and texture consistent with the E and Bt horizons. The E part ranges from 10 to 90 percent, by volume.

### Bt horizon:

Hue--2.5Y or 10YR  
Value--4 to 6  
Chroma--2 or 3  
Texture--silty clay loam or clay loam  
Reaction--pH 6.1 to 7.3  
Thickness--10 to 80 centimeters

### 2Cd horizon:

Hue--2.5Y or 10YR  
Value--4 or 6  
Chroma--2 to 6  
Texture--coarse sand to loamy sand  
Reaction--pH 6.1 to 8.4  
Thickness--20 to 100 centimeters

### 3R horizon:

Depth to bedrock ranges from 102 to 200 centimeters. In some cases, bedrock is very deep.

**COMPETING SERIES:** These are the Buhl, Centuria, and Mooseline series. None of these series has a lithic contact.

## Soil Survey of Voyageurs National Park, Minnesota

**GEOGRAPHIC SETTING:** Voyageurs soils are on slightly concave to convex surfaces on lacustrine-modified, bedrock-controlled, till-floored lake plains. Slopes range from 0 to 6 percent. The soils formed in silty glaciolacustrine materials over till over bedrock. Mean annual air temperature is 2 to 4 degrees C. Mean annual precipitation is 610 millimeters. The frost-free period is 95 to 125 days. Elevation above sea level is 337 to 390 meters.

**GEOGRAPHICALLY ASSOCIATED SOILS:** These are the Conic, Baudette, and Spooner, till substratum soils. The moderately well drained Baudette, till substratum and the poorly drained Spooner, till substratum soils form a hydrosequence with the Voyageurs soils. The Baudette, till substratum soils and Conic soils occur in higher landscape positions. The Spooner, till substratum soils occur in lower landscape positions.

**DRAINAGE AND SATURATED HYDRAULIC CONDUCTIVITY:** Voyageurs soils are somewhat poorly drained. Runoff is low to medium. Saturated hydraulic conductivity is moderately low. The soils have seasonal high saturation at a depth of 1 foot at some time from April through June and from October through November in normal years.

**USE AND VEGETATION:** Most areas are forested. Principal trees are aspen, balsam fir, white spruce, black spruce, and jack pine. Native vegetation is mixed coniferous and deciduous forest.

**DISTRIBUTION AND EXTENT:** Northeastern Minnesota, MLRA—93A. Small extent.

**MLRA SOIL SURVEY REGIONAL OFFICE (MO) RESPONSIBLE:** St. Paul, Minnesota.  
**SERIES ESTABLISHED:** St. Louis County, Minnesota, 2015.

### REMARKS:

Particle-size control section--17 to 70 centimeters

Series control section--0 to 95 centimeters

Soil moisture control section--1 to 30 centimeters

Soil temperature control section--0 to 50 centimeters

Diagnostic horizons and features recognized in this pedon are:

Ochric epipedon--the zone from 0 to 17 centimeters (A and E horizons);

Albic horizon--the zone from 7 to 17 centimeters (E horizon);

Argillic horizon--the zone from 17 to 70 centimeters (E/Bt and Bt horizons);

Glossic horizon--the zone from 17 to 30 centimeters;

Lithic contact--140 centimeters;

Redoximorphic concentrations--25 centimeters;

Redoximorphic depletions--25 centimeters.

Aquic subgroup based on 2-chroma iron depletions in the upper 25 centimeters of the argillic horizon and aquic conditions for some time in normal years

Abrupt textural change--at the upper boundary of the 2Cd horizon

Lithologic discontinuity--the zone from 70 to 140 centimeters

Taxonomy version--Keys to Soil Taxonomy, 12th edition, 2014

National Cooperative Soil Survey  
U.S.A.

## Appendix 2—Soil Descriptions for Transects 1 and 2

### Transect 1, A to B

#### **Pedon 1: Greenwood**

*User pedon ID:* P2012MN137VOYA732

*Drainage:* Very poorly drained

*Geomorphic setting:* Toeslope; upslope shape—linear; cross-slope shape—linear

*Profile:*

Oi—0 to 35 cm; yellowish brown (10YR 5/4) and dark yellowish brown (10YR 3/4) peat.

Oe—35 to 130 cm; black (7.5YR 2.5/1) mucky peat.

#### **Pedon 2: Insula**

*User pedon ID:* P2012MN137VOYA731

*Correlated classification:* Loamy, isotic, frigid Lithic Dystrudepts

*Slope:* 12 percent

*Drainage:* Well drained

*Geomorphic setting:* Backslope; upslope shape—convex; cross-slope shape—convex

*Surface fragments:* 51.0 percent

*Profile:*

Oe—0 to 2 cm; black (7.5YR 2.5/1) moderately decomposed plant material.

A—2 to 5 cm; very dark gray (10YR 3/1) cobbly silt loam; 5 percent gravel and 15 percent cobbles.

Bw1—5 to 15 cm; dark yellowish brown (10YR 3/4) cobbly silt loam; 5 percent gravel and 15 percent cobbles.

Bw2—15 to 29 cm; dark yellowish brown (10YR 4/4) cobbly silt loam; 5 percent gravel and 15 percent cobbles.

R—29 to 200 cm.

#### **Pedon 3: Voyageurs**

*User pedon ID:* P2012MN137VOYA730

*Slope:* 1 percent

*Drainage:* Somewhat poorly drained

*Geomorphic setting:* Footslope; upslope shape—linear; cross-slope shape—linear

*Profile:*

Oe—0 to 2 cm; black (10YR 2/1) moderately decomposed plant material.

A—2 to 5 cm; black (10YR 2/1) silt loam.

B/E—5 to 54 cm; grayish brown (10YR 5/2) and brown (10YR 4/3) silt loam and silty clay loam.

2C—54 to 64 cm; brown (10YR 5/3) sandy loam; 10 percent gravel.

R—64 to 200 cm.

#### **Pedon 4: Aquent**

*User pedon ID:* P2012MN137VOYA729

*Drainage:* Very poorly drained

*Geomorphic setting:* Toeslope; upslope shape—concave; cross-slope shape—linear

*Profile:*

Oe—0 to 5 cm; black (7.5YR 2.5/1) mucky peat.

A and C—5 to 60 cm; dark gray (10YR 4/1) and black (10YR 2/1) gravelly coarse sand and mucky loam.

Cg—60 to 78 cm; dark gray (10YR 4/1) gravelly sandy loam; 20 percent gravel.

R—78 to 200 cm.

**Pedon 5: Voyageurs, deep phase**

*User pedon ID:* P2012MN137VOYA728

*Slope:* 1 percent

*Drainage:* Somewhat poorly drained

*Geomorphic setting:* Footslope; upslope shape—linear; cross-slope shape—linear

*Profile:*

Oe—0 to 3 cm; black (10YR 2/1) moderately decomposed plant material.

A—3 to 8 cm; black (10YR 2/1) silt loam.

E—8 to 29 cm; grayish brown (10YR 5/2) silt loam.

B/E—29 to 37 cm; brown (10YR 4/3) and grayish brown (10YR 5/2) silt loam and silty clay loam.

Bt—37 to 76 cm; brown (10YR 4/3) silty clay loam.

C1—76 to 122 cm; grayish brown (10YR 5/2), dark yellowish brown (10YR 3/4), and brown (10YR 4/3) stratified silt loam to silty clay loam.

2C2—122 to 152 cm; brown (7.5YR 4/3) gravelly loamy coarse sand; 20 percent gravel.

**Pedon 6: Insula**

*User pedon ID:* P2012MN137VOYA727

*Correlated classification:* Loamy, isotic, frigid Lithic Dystrudepts

*Slope:* 7 percent

*Drainage:* Well drained

*Geomorphic setting:* Backslope; upslope shape—convex; cross-slope shape—convex

*Surface fragments:* 9.0 percent

*Profile:*

Oe—0 to 5 cm; black (7.5YR 2.5/1) moderately decomposed plant material.

A—5 to 11 cm; black (7.5YR 2.5/1) very cobbly fine sandy loam; 15 percent gravel, 25 percent cobbles, and 5 percent stones.

Bhs1—11 to 22 cm; very dark brown (7.5YR 2.5/3) very cobbly fine sandy loam; 15 percent gravel, 25 percent cobbles, and 5 percent stones.

Bhs2—22 to 32 cm; dark brown (7.5YR 3/3) very cobbly fine sandy loam; 15 percent gravel, 25 percent cobbles, and 5 percent stones.

Bs—32 to 48 cm; brown (7.5YR 4/4) very cobbly fine sandy loam; 15 percent gravel, 25 percent cobbles, and 5 percent stones.

R—48 to 200 cm.

**Pedon 7: Insula**

*User pedon ID:* P2012MN137VOYA726

*Correlated classification:* Loamy, isotic, frigid Lithic Dystrudepts

*Slope:* 3 percent

*Drainage:* Well drained

*Geomorphic setting:* Backslope; upslope shape—convex; cross-slope shape—convex

*Surface fragments:* 1.5 percent

*Profile:*

Oe—0 to 3 cm; very dark brown (7.5YR 2.5/2) moderately decomposed plant material.

A—3 to 9 cm; black (7.5YR 2.5/1) cobbly fine sandy loam; 10 percent gravel and 15 percent cobbles.

Bhs—9 to 16 cm; dark brown (7.5YR 3/3) cobbly fine sandy loam; 10 percent gravel and 15 percent cobbles.

Bs—16 to 34 cm; brown (7.5YR 4/4) cobbly fine sandy loam; 10 percent gravel and 15 percent cobbles.

Bw—34 to 48 cm; brown (7.5YR 5/4) cobbly fine sandy loam; 10 percent gravel and 15 percent cobbles.

R—48 to 200 cm.



**Pedon 8: Wahlsten**

*User pedon ID:* P2012MN137VOYA725

*Slope:* 1 percent

*Drainage:* Somewhat poorly drained

*Geomorphic setting:* Footslope; upslope shape—linear; cross-slope shape—linear

*Surface fragments:* 1.5 percent

*Profile:*

Oe—0 to 5 cm; very dark brown (7.5YR 2.5/2) moderately decomposed plant material.

A—5 to 10 cm; very dark brown (10YR 2/2) gravelly fine sandy loam; 15 percent gravel and 10 percent cobbles.

Bw—10 to 61 cm; brown (10YR 4/3) gravelly fine sandy loam; 15 percent gravel.

2C—61 to 94 cm; strong brown (7.5YR 4/6) gravelly coarse sand; 20 percent gravel.

R—94 to 200 cm.

**Pedon 9: Insula**

*User pedon ID:* P2012MN137VOYA724

*Correlated classification:* Loamy, isotic, frigid Lithic Dystrudepts

*Slope:* 4 percent

*Drainage:* Well drained

*Geomorphic setting:* Summit; upslope shape—convex; cross-slope shape—convex

*Surface fragments:* 1.5 percent

*Profile:*

Oe—0 to 3 cm; black (7.5YR 2.5/1) moderately decomposed plant material.

A—3 to 9 cm; very dark brown (7.5YR 2.5/2) cobbly silt loam; 5 percent gravel and 10 percent cobbles.

Bhs—9 to 14 cm; dark brown (7.5YR 3/3) cobbly silt loam; 5 percent gravel and 10 percent cobbles.

Bs—14 to 34 cm; brown (7.5YR 4/4) cobbly silt loam; 5 percent gravel and 10 percent cobbles.

R—34 to 200 cm.

**Pedon 10: Insula**

*User pedon ID:* P2012MN137VOYA723

*Correlated classification:* Loamy, isotic, frigid Lithic Dystrudepts

*Slope:* 1 percent

*Drainage:* Well drained

*Geomorphic setting:* Summit; upslope shape—convex; cross-slope shape—convex

*Surface fragments:* 1.5 percent

*Profile:*

Oe—0 to 4 cm; black (7.5YR 2.5/1) moderately decomposed plant material.

E—4 to 8 cm; brown (7.5YR 4/2) cobbly loam; 5 percent gravel, 15 percent cobbles, and 1 percent stones.

Bs1—8 to 14 cm; dark brown (7.5YR 3/4) cobbly loam; 5 percent gravel, 15 percent cobbles, and 1 percent stones.

Bs2—14 to 44 cm; brown (7.5YR 4/4) cobbly loam; 5 percent gravel, 15 percent cobbles, and 1 percent stones.

R—44 to 200 cm.

**Transect 2, A to B**

**Pedon 1: Conic**

*User pedon ID:* P2012MN137VOYA020

*Slope:* 7 percent

*Drainage:* Well drained

*Geomorphic setting:* Backslope; upslope shape—convex; cross-slope shape—linear

*Surface fragments:* 1.5 percent

*Profile:*

Oa—0 to 5 cm; black (10YR 2/1) highly decomposed plant material.

E—5 to 9 cm; dark gray (10YR 4/1) sandy loam.

Bw1—9 to 20 cm; dark brown (10YR 3/3) loam.

Bw2—20 to 50 cm; brown (10YR 4/3) loam.

C—50 to 80 cm; brown (10YR 4/3) cobbly loam.

2R—80 to 203 cm.

**Pedon 2: Canthook**

*User pedon ID:* P2012MN137VOYA021

*Slope:* 3 percent

*Drainage:* Moderately well drained

*Geomorphic setting:* Backslope; upslope shape—convex; cross-slope shape—convex

*Surface fragments:* 0.1 percent

*Profile:*

Oa—0 to 5 cm; black (10YR 2/1) highly decomposed plant material.

E—5 to 10 cm; grayish brown (10YR 5/2) fine sandy loam.

Bg1—10 to 30 cm; dark grayish brown (10YR 4/2) fine sandy loam.

Bg2—30 to 52 cm; brown (10YR 4/3) fine sandy loam.

2Bt1—52 to 80 cm; light olive brown (2.5Y 5/3) sandy clay loam.

2Bt2—80 to 110 cm; grayish brown (2.5Y 5/2) silty clay loam.

3C—110 to 115 cm; dark yellowish brown (10YR 4/4) stratified sandy loam and silty clay loam.

**Pedon 3: Conic**

*User pedon ID:* P2012MN137VOYA022

*Slope:* 40 percent

*Drainage:* Well drained

*Geomorphic setting:* Backslope; upslope shape—convex; cross-slope shape—convex

*Surface fragments:* 1.5 percent

*Profile:*

Oa—0 to 3 cm; black (10YR 2/1) highly decomposed plant material.

A/E—3 to 13 cm; brown (10YR 5/3) fine sandy loam.

Bw1—13 to 30 cm; dark grayish brown (10YR 4/2) fine sandy loam.

Bw2—30 to 50 cm; dark yellowish brown (10YR 4/4) fine sandy loam.

2R—50 to 203 cm.

**Pedon 4: Littleswan**

*User pedon ID:* P2012MN137VOYA024

*Slope:* 5 percent

*Drainage:* Somewhat poorly drained

*Geomorphic setting:* Backslope; upslope shape—linear; cross-slope shape—linear

*Surface fragments:* 0.1 percent

*Profile:*

Oe—0 to 3 cm; black (10YR 2/1) moderately decomposed plant material.

A—3 to 10 cm; black (10YR 2/1) silt loam.

E—10 to 40 cm; gray (2.5Y 5/1) silt loam; 1 percent gravel.

Btg—40 to 80 cm; dark grayish brown (2.5Y 4/2) silty clay loam; 0 percent coarse fragments.

Bt—80 to 100 cm; olive brown (2.5Y 4/3) silty clay loam.

Cg—100 to 203 cm; dark grayish brown (2.5Y 4/2) silty clay loam.

**Pedon 5: Hamre**

*User pedon ID:* P2012MN137VOYA023

*Slope:* 1 percent

*Drainage:* Very poorly drained

*Geomorphic setting:* Backslope; upslope shape—linear; cross-slope shape—convex

*Profile:*

A—0 to 12 cm; black (10YR 2/1) mucky silt loam.

Eg—12 to 24 cm; dark gray (2.5Y 4/1) gravelly silt loam.

Bg1—24 to 57 cm; grayish brown (2.5Y 5/2) gravelly silty clay.

2Bg2—57 to 110 cm; grayish brown (2.5Y 5/2) silty clay loam.

2Cg—110 to 203 cm; grayish brown (2.5Y 5/2) silt loam.

**Pedon 6: Quetico**

*User pedon ID:* P2012MN137VOYA025

*Slope:* 55 percent

*Drainage:* Well drained

*Geomorphic setting:* Backslope; upslope shape—linear; cross-slope shape—convex

*Surface fragments:* 1.5 percent

*Profile:*

Oa—0 to 10 cm; black (10YR 2/1) highly decomposed plant material.

Bw—10 to 20 cm; very dark grayish brown (10YR 3/2) fine sandy loam.

2R—20 to 203 cm.

**Pedon 7: Voyageurs (P), moderately deep**

*User pedon ID:* P2012MN137VOYA027

*Slope:* 2 percent

*Drainage:* Well drained

*Geomorphic setting:* Backslope; upslope shape—convex; cross-slope shape—convex

*Surface fragments:* 0.1 percent

*Profile:*

Oa—0 to 2 cm; black (10YR 2/1) highly decomposed plant material.

A—2 to 6 cm; black (10YR 2/1) silt loam.

E—6 to 20 cm; light olive brown (2.5Y 5/3) silt loam.

Bg—20 to 30 cm; grayish brown (2.5Y 5/2) silt loam.

Btg—30 to 90 cm; gray (10YR 5/1) silty clay loam.

2Cg—90 to 100 cm; dark grayish brown (2.5Y 4/2) stratified silty clay loam/coarse sand.

3R—100 to 203 cm.

**Pedon 8: Conic**

*User pedon ID:* P2012MN137VOYA028

*Slope:* 7 percent

*Drainage:* Well drained

*Geomorphic setting:* Backslope; upslope shape—convex; cross-slope shape—convex

*Surface fragments:* 0.1 percent

*Profile:*

Oa—0 to 4 cm; black (10YR 2/1) highly decomposed plant material.

AE—4 to 10 cm; dark grayish brown (10YR 4/2) fine sandy loam.

Bw—10 to 59 cm; dark yellowish brown (10YR 4/4) fine sandy loam.

2R—59 to 203 cm.

**Pedon 9: Quetico**

*User pedon ID:* P2012MN137VOYA029

*Slope:* 55 percent

Soil Survey of Voyageurs National Park, Minnesota

*Drainage:* Well drained

*Geomorphic setting:* Backslope; upslope shape—linear; cross-slope shape—linear

*Surface fragments:* 32.5 percent

*Profile:*

Oa—0 to 5 cm; black (10YR 2/1) highly decomposed plant material.

Bw—5 to 25 cm; dark brown (10YR 3/3) gravelly fine sandy loam.

2R—25 to 203 cm.

## Appendix 3—Information on Lab-Sampled Pedons

(KSSL indicates Kellogg Soil Survey Laboratory)

Current soil name	Pedon type	User site ID	User pedon ID	Lab source	Lab pedon number
Canthook	Representative pedon for component	S2013MN137VOYA027	S2013MN137VOYA027	KSSL	14N0282
Conic	Representative pedon for component	S2013MN137VOYA003	S2013MN137VOYA003	KSSL	14N0273
Dishno	Representative pedon for component	S2013MN137VOYA034	S2013MN137VOYA034	KSSL	14N0285
Durkeelake	Representative pedon for component	S2013MN137VOYA018	S2013MN137VOYA018	KSSL	14N0278
Grasston	Confirmation description	S2013MN137VOYA028	S2013MN137VOYA028	KSSL	14N0283
Insula	Confirmation description	S2013MN137VOYA011	S2013MN137VOYA011	KSSL	14N0277
Longsiding	Representative pedon for component	S2013MN137VOYA023	S2013MN137VOYA023	KSSL	14N0279
Minong	Confirmation description	S2013MN137VOYA009	S2013MN137VOYA009	KSSL	14N0275
Namakan	Confirmation description	S2013MN137VOYA026	S2013MN137VOYA026	KSSL	14N0281
Quetico	Representative pedon for component	S2013MN137VOYA004	S2013MN137VOYA004	KSSL	14N0274
Soudan	Confirmation description	S2013MN137VOYA030	S2013MN137VOYA030	KSSL	14N0284
Voyageurs	Confirmation description	S2013MN137VOYA010	S2013MN137VOYA010	KSSL	14N0276
Voyageurs	Confirmation description	S2013MN137VOYA025	S2013MN137VOYA025	KSSL	14N0280
Wahlsten	Representative pedon for component	S2013MN137VOYA002	S2013MN137VOYA002	KSSL	14N0272

## Appendix 4—Peatland Inventory Data – Minnesota

Minnesota Department of Natural Resources, Division of Lands and Minerals,  
Update 2007, <https://catalog.data.gov/dataset/peat-inventory-data-minnesota>

### **DNR Peat Inventory ID: KOOC-2206909-208**

*County:* Koochiching

*Site #:* 208

*Location:* 6 meters (20 feet) south and 716 meters (230 feet) west of the northeast corner of Section 9, Township 69, Range 22; USGS Quad: Ray

*Profile:*

0 to 30 centimeters—very slightly decomposed fibric material  
30 to 120 centimeters—slightly decomposed hemic material  
120 to 150 centimeters—peat  
150 to 180 centimeters—moderately well decomposed hemic material  
180 to 335 centimeters—slightly decomposed hemic material  
335 to 455 centimeters—moderately well decomposed hemic material  
455 to 490 centimeters—slightly decomposed hemic material  
490 to 520 centimeters—strongly decomposed sapric material  
520 to 610 centimeters—very strongly decomposed sapric material  
610 centimeters—silty clay

### **DNR Peat Inventory ID: KOOC-2206910-6**

*County:* Koochiching

*Site #:* 6

*Location:* 6 meters (20 feet) south and 6 meters (20 feet) east of the northwest corner of Section 10, Township 69, Range 22; USGS Quad: Ray

*Profile:*

0 to 10 centimeters—very slightly decomposed fibric material  
10 to 50 centimeters—slightly decomposed hemic material  
50 to 75 centimeters—very slightly decomposed fibric material  
75 to 135 centimeters—slightly decomposed hemic material  
135 to 290 centimeters—very slightly decomposed fibric material  
290 to 460 centimeters—slightly decomposed hemic material  
460 to 475 centimeters—moderately well decomposed hemic material  
475 to 505 centimeters—strongly decomposed sapric material  
505 centimeters—silty clay loam

### **DNR Peat Inventory ID: KOOC-2206910-212**

*County:* Koochiching

*Site #:* 212

*Location:* 777 meters (2,550 feet) west and 6 meters (20 feet) south of the northeast corner of Section 10, Township 69, Range 22; USGS Quad: Ray

*Profile:*

0 to 180 centimeters—very slightly decomposed fibric material  
180 to 240 centimeters—slightly decomposed hemic material  
240 to 330 centimeters—well decomposed hemic material  
330 centimeters—fine sand

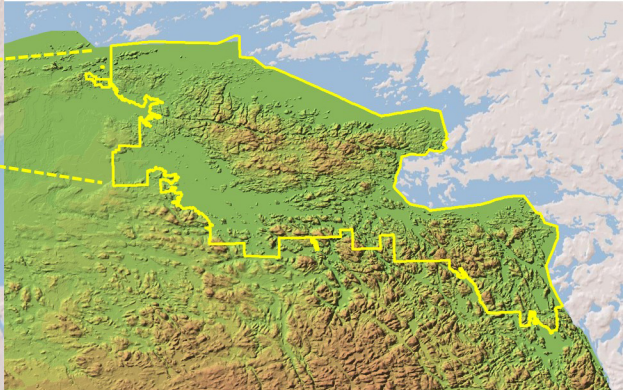
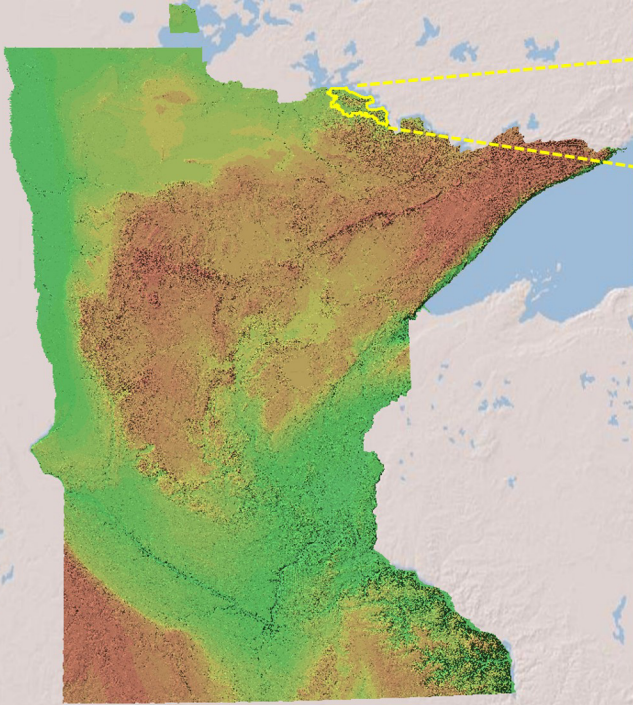
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### Voyageurs Nat. Park Boundary



Elevation - meters

High 701



Low 183

High 428

Voyageurs NP  
Elevation range

Low 336



# General Soil Map

Voyageurs National Park

## Legend

Soils formed in Glacial Till

1 Insula-Conic-Quetico

Soils formed in Lacustrine

2 Spooner-Sax-Voyageurs

Soils formed in organic material

3 Greenwood-Rifle-Tacoosh

Water

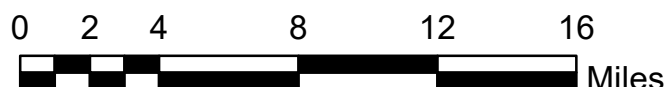
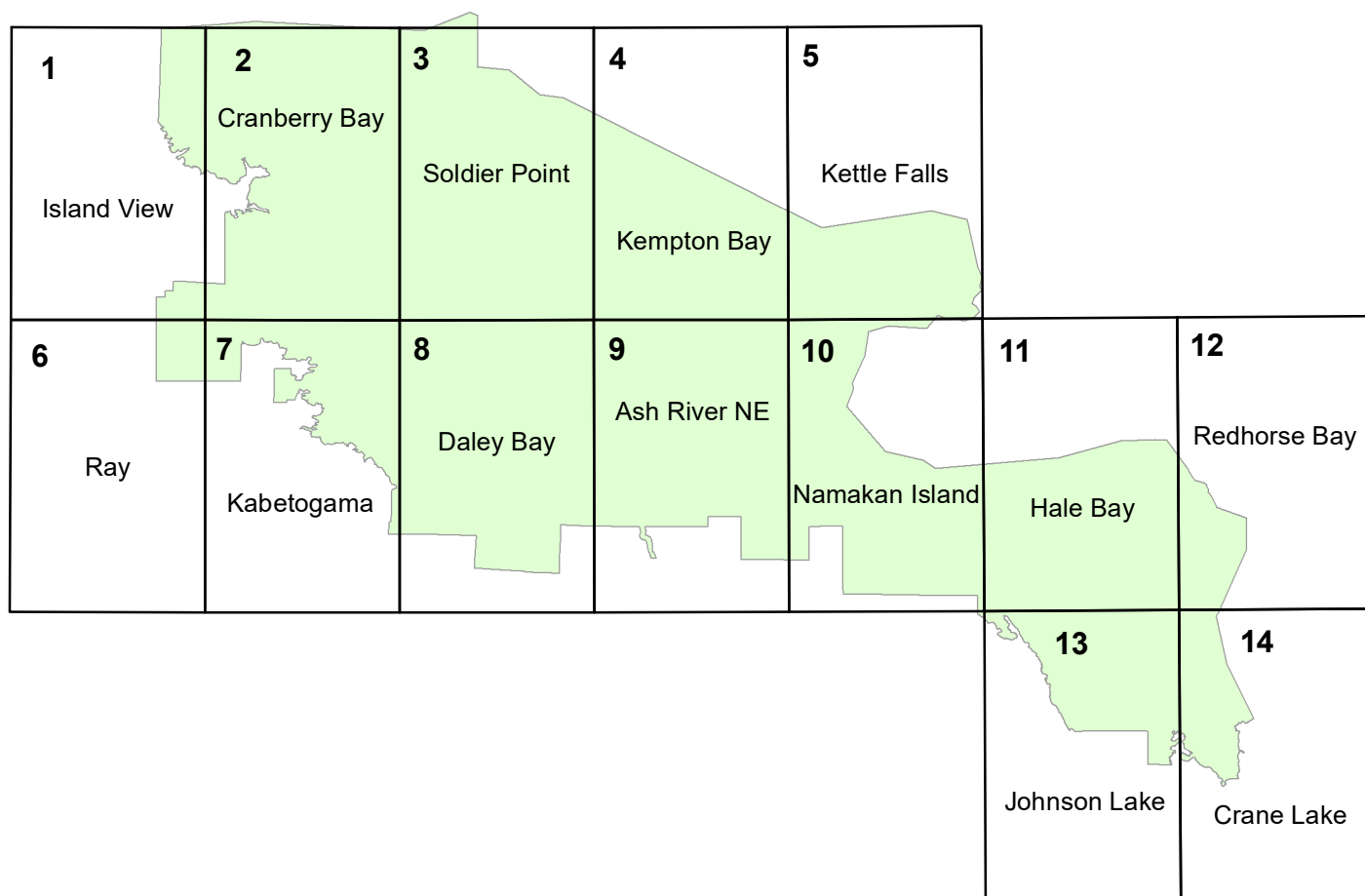


1:200,000

0 2.5 5 10 Miles

# INDEX TO MAP SHEETS

## Soil Survey of Voyageurs National Park



U.S. DEPARTMENT OF  
AGRICULTURE

NATURAL RESOURCES  
CONSERVATION SERVICE

**MAP UNIT LEGEND**  
**VOYAGEURS NATIONAL PARK,**  
**MINNESOTA**

U.S. DEPARTMENT  
OF THE INTERIOR

NATIONAL PARK  
SERVICE

**SYMBOL**

**NAME**

2srmd	Quetico-Insula, bouldery-Rock outcrop complex, 3 to 18 percent slopes, LRU 93C
2srqm	Quetico-Insula, bouldery-Rock outcrop complex, 8 to 60 percent slopes
2srqn	Insula-Conic-Rock outcrop complex, 8 to 25 percent slopes, very bouldery
2srqp	Quetico-Insula, very bouldery-Greenwood complex, 0 to 12 percent slopes, very rocky
2sqr	Greenwood peat, 0 to 1 percent slopes
2sqrq	Insula-Conic-Wahlsten complex, 0 to 12 percent slopes, very stony, very rocky
2sqrq	Voyageurs, oxyaquic-Conic, very stony-Littleswan complex, 0 to 12 percent slopes, rocky
2sqrw	Wahlsten, very stony-Spooner-Voyageurs complex, 0 to 8 percent slopes, rocky
2srqy	Baudette-Littleswan complex, 0 to 8 percent slopes
2srqz	Canthook-Durkeelake complex, 0 to 12 percent slopes
2srr3	Spooner-Sax complex, 0 to 2 percent slopes
2srr4	Littleswan-Spooner complex, 0 to 3 percent slopes
2srr7	Mooselake mucky peat, 0 to 1 percent slopes
2srr8	Rifle mucky peat, 0 to 1 percent slopes
2srr9	Tacoosh and Sax soils, 0 to 1 percent slopes, frequently flooded
2srrb	Aquents, Sax, and Tacoosh soils, 0 to 1 percent slopes, ponded
2srrh	Greenwood peat, 0 to 1 percent slopes, seasonally ponded
2srrj	Rifle mucky peat, 0 to 1 percent slopes, seasonally ponded
2srrk	Insula-Conic-Wahlsten complex, 0 to 25 percent slopes, very stony, very rocky
2srrl	Tacoosh and Sax soils, 0 to 1 percent slopes, occasionally flooded
2srrm	Brickton-Hassman complex, 0 to 2 percent slopes
2srrn	Brickton-Dalbo complex, 0 to 3 percent slopes
2srrq	Cathro and Tacoosh soils, 0 to 1 percent slopes, ponded
2srrr	Insula, very stony-Voyageurs-Wahlsten, very stony complex, 0 to 12 percent slopes, very rocky
2srrt	Bowstring and Fluvaquents soils, 0 to 2 percent slopes, frequently flooded
W	Water



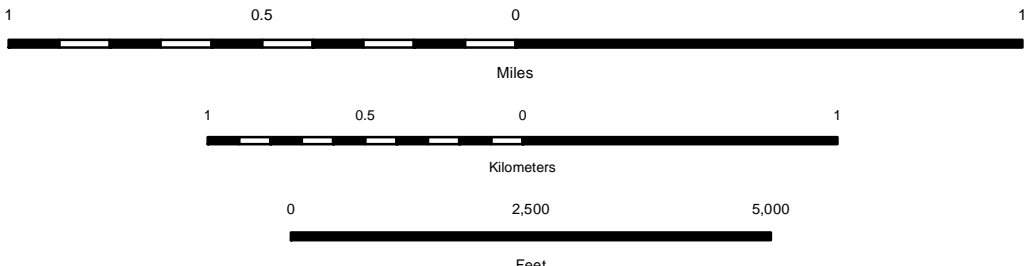


This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service.

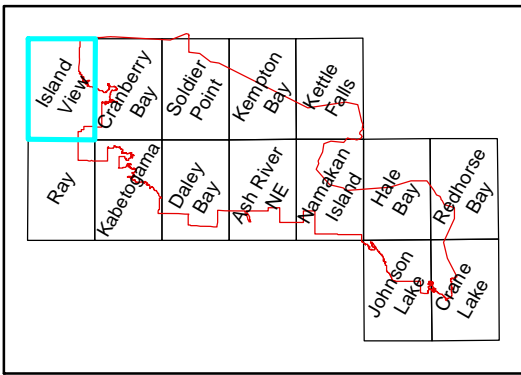
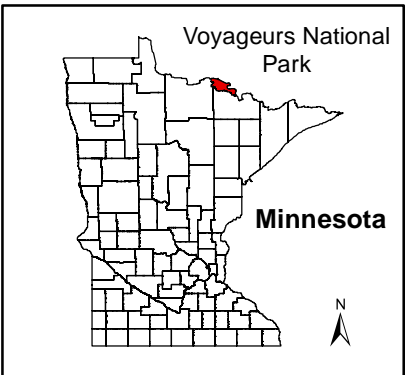
Aerial imagery provided by the National Agriculture Imagery Program (NAIP), 2006 to present.

National Hydrography Dataset (NHD), National Elevation Dataset (NED) and Geographic Names Information System (GNIS) provided by the U.S. Department of Interior, U.S. Geological Survey (USGS).

North American Datum of 1983 (NAD83).  
Universal Transverse Mercator (UTM) coordinate system.



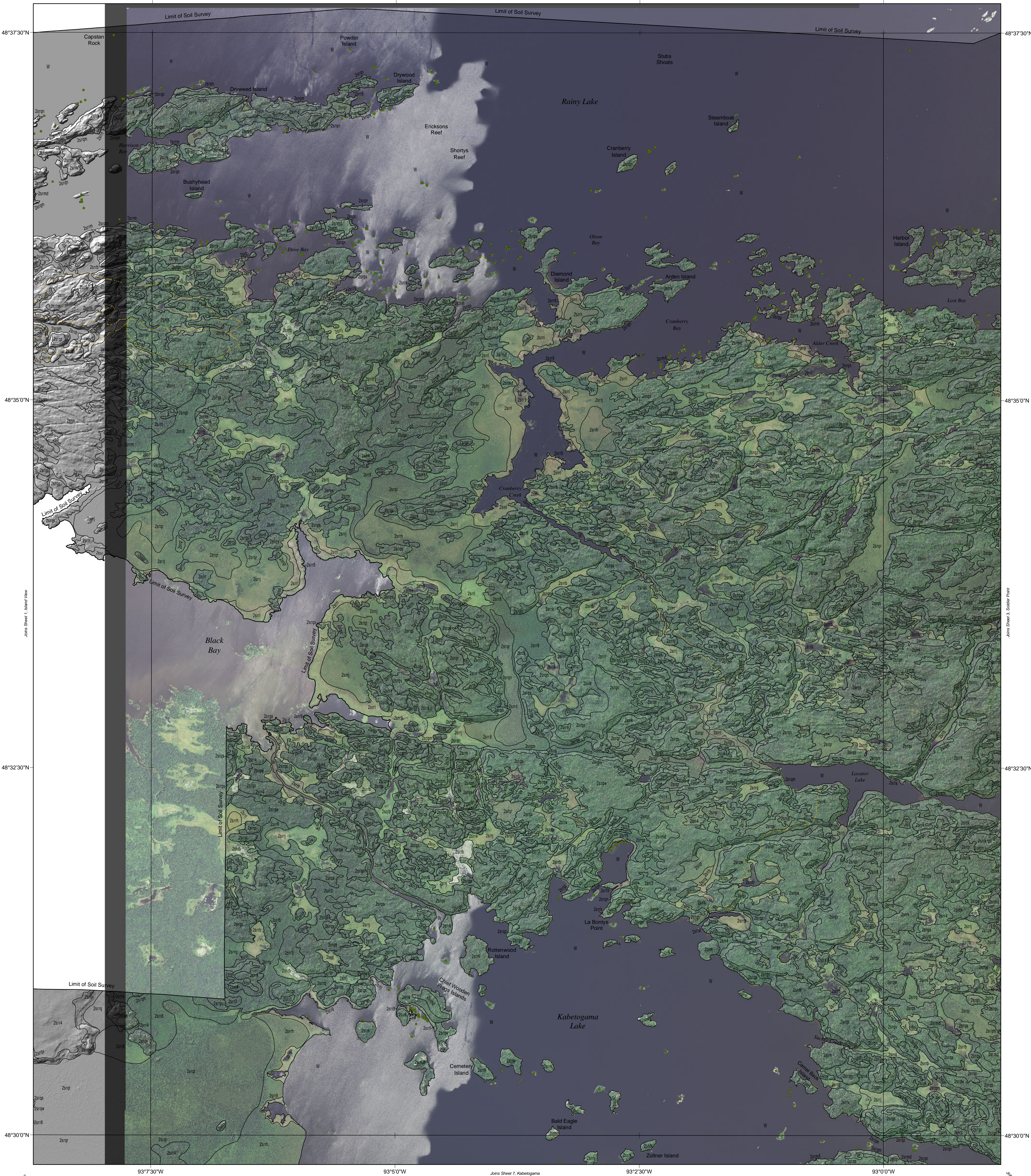
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VOYAGEURS NATIONAL PARK  
MINNESOTA

SHEET 1 OF 14



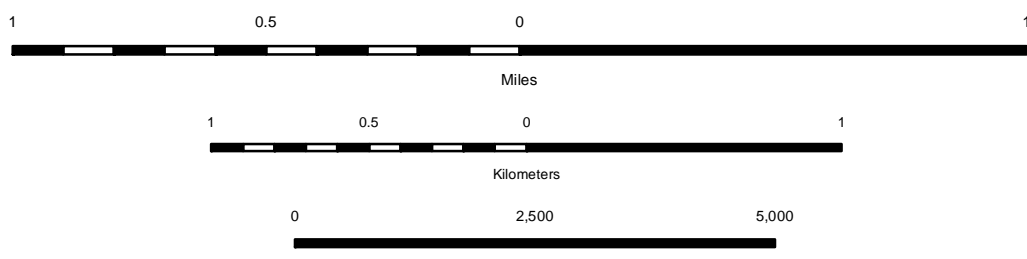


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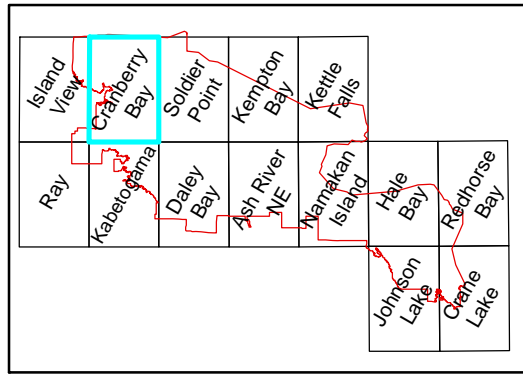
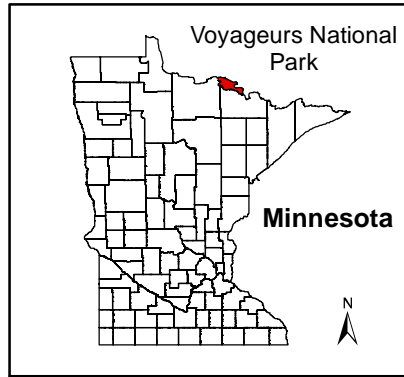
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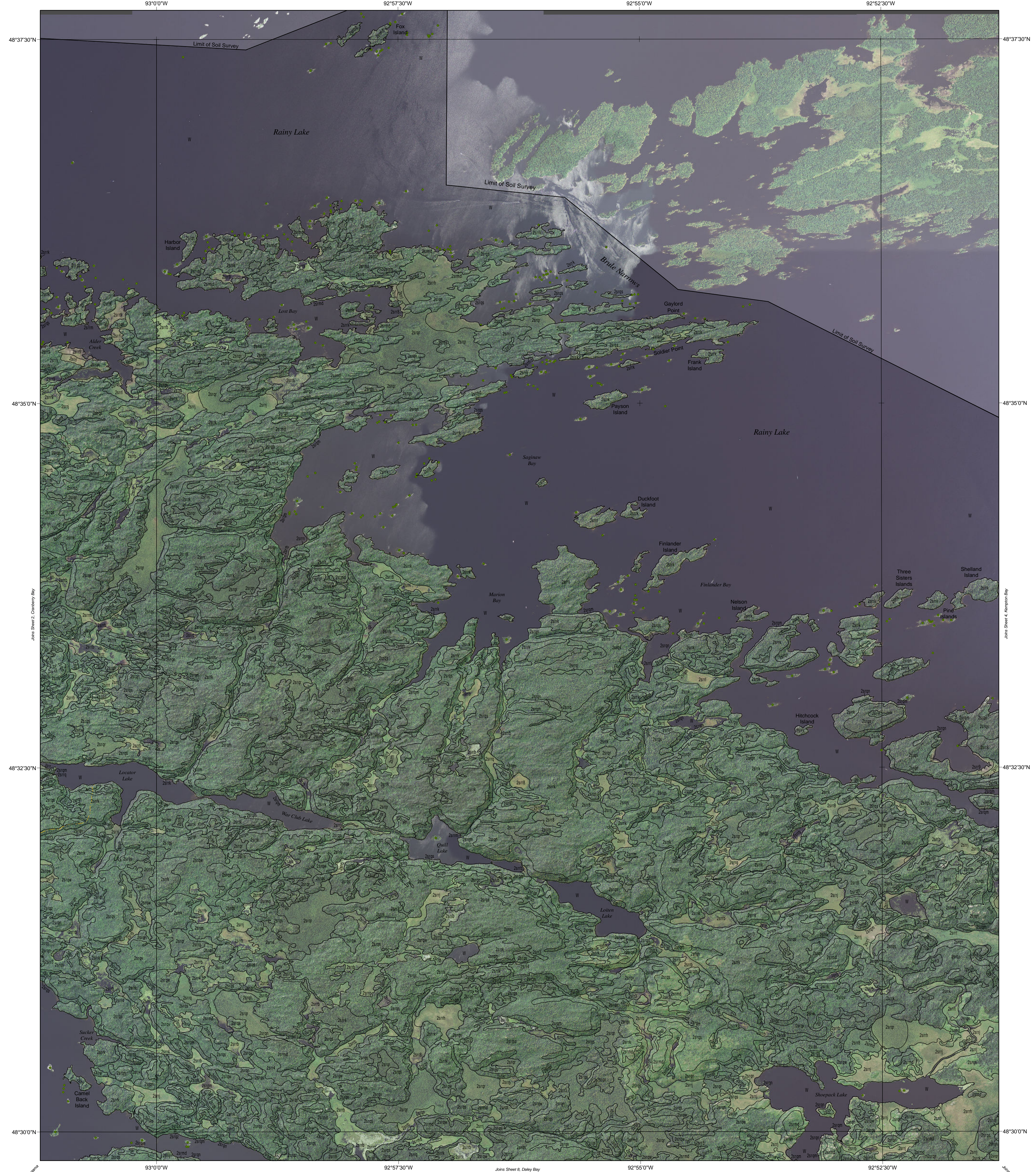
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VOYAGEURS NATIONAL PARK,  
MINNESOTA

SHEET 2 OF 14



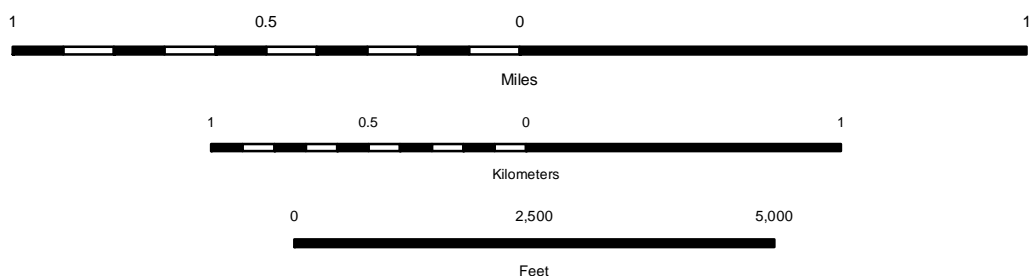


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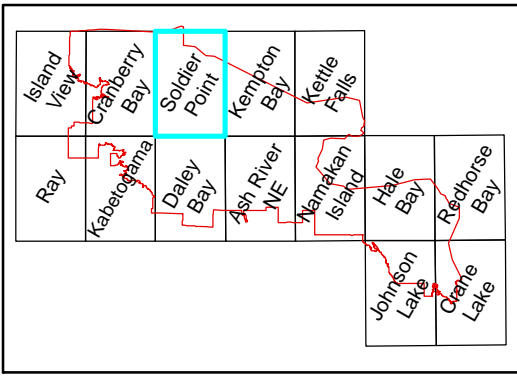
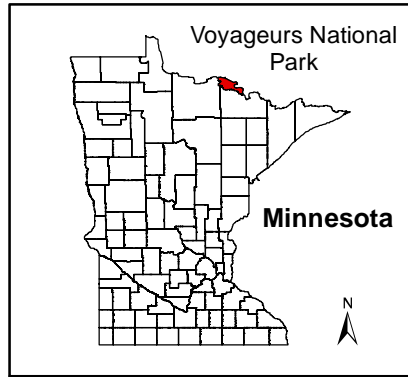
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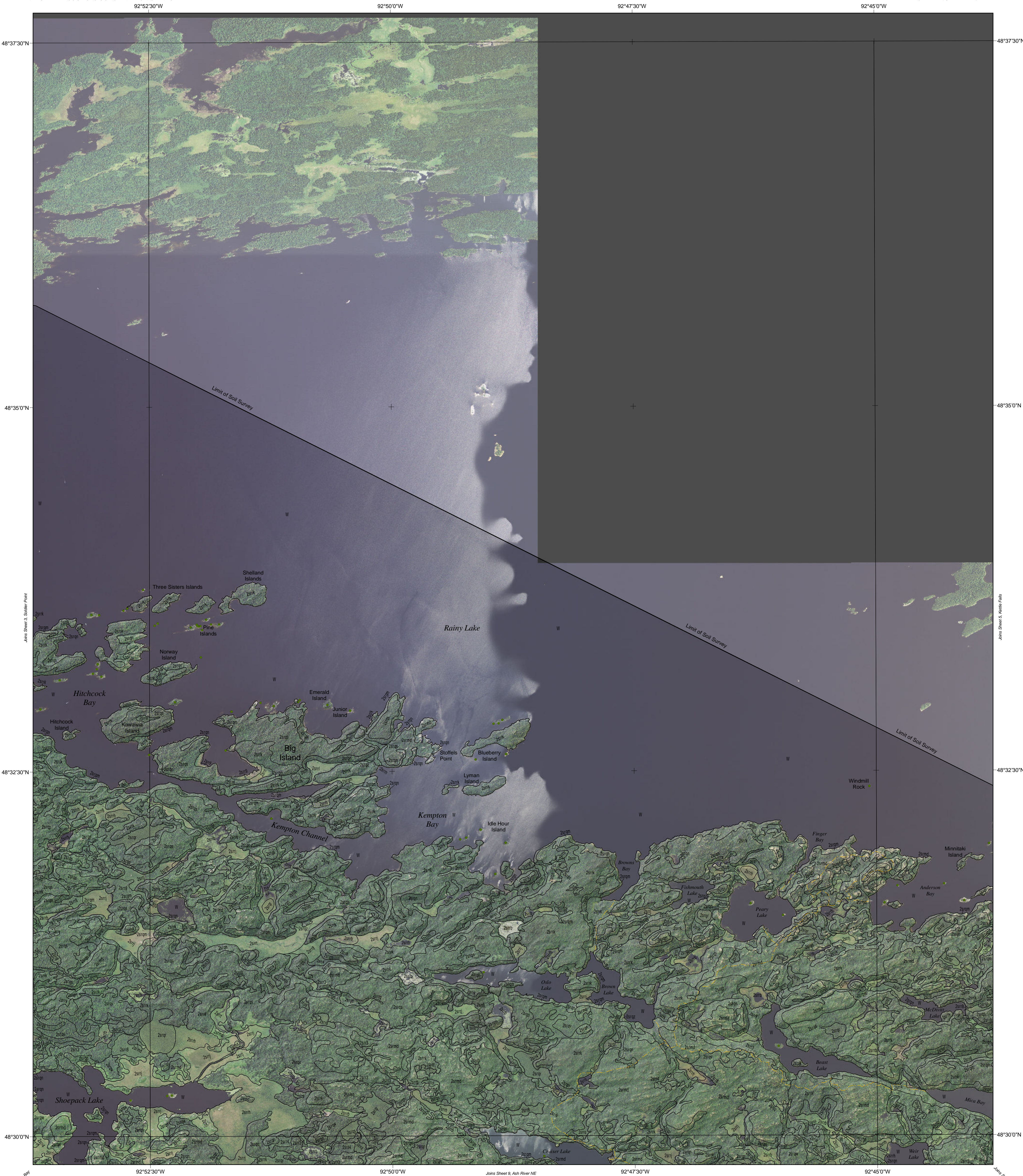
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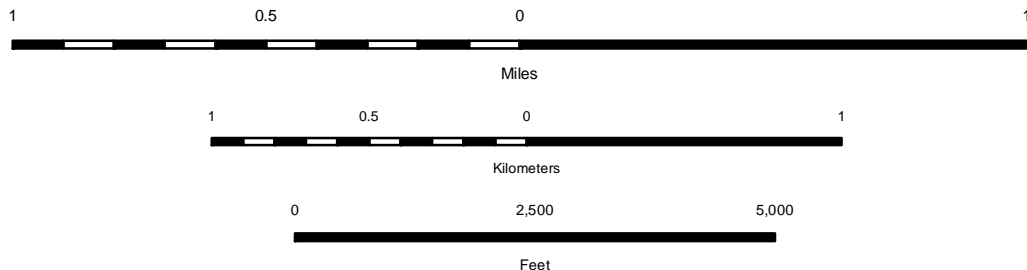


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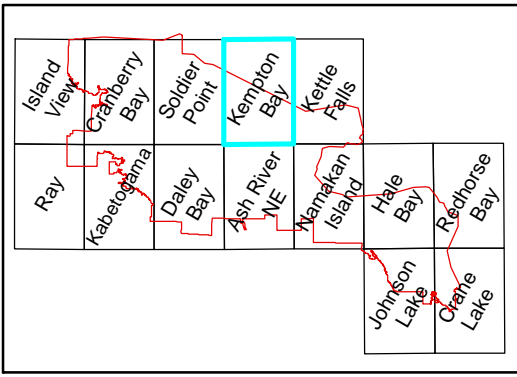
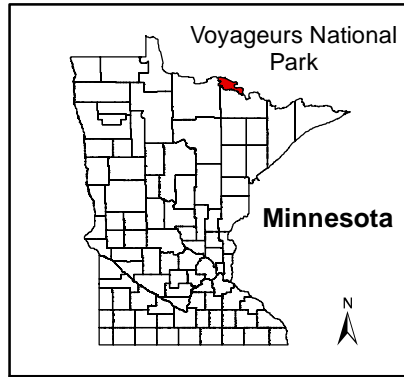
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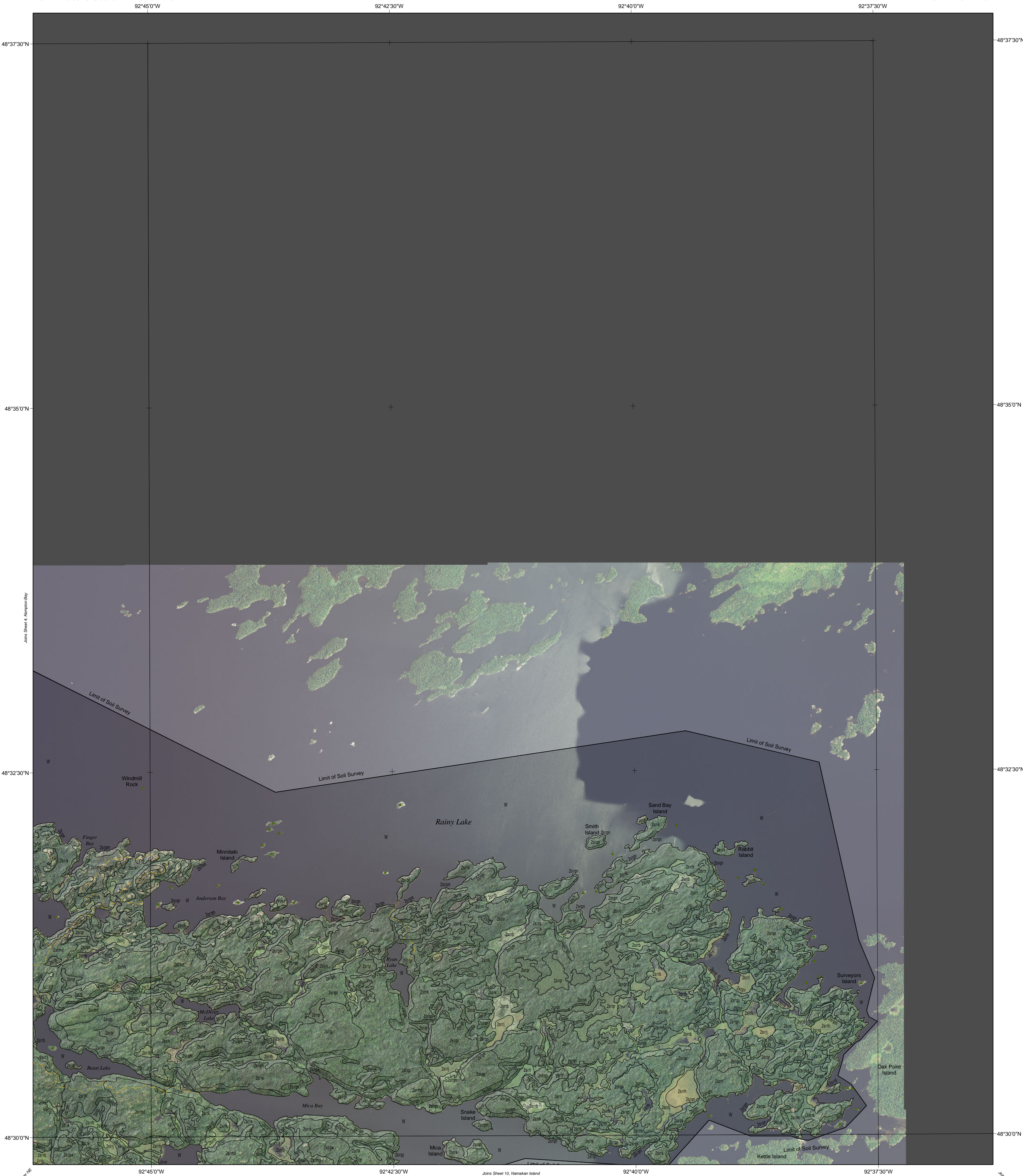
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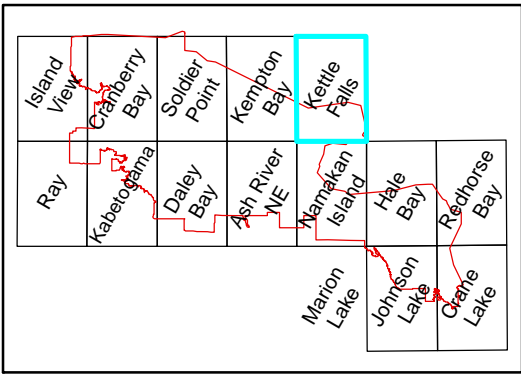
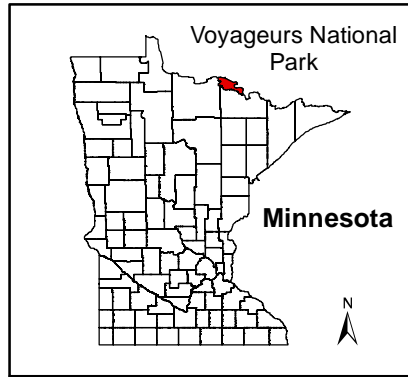
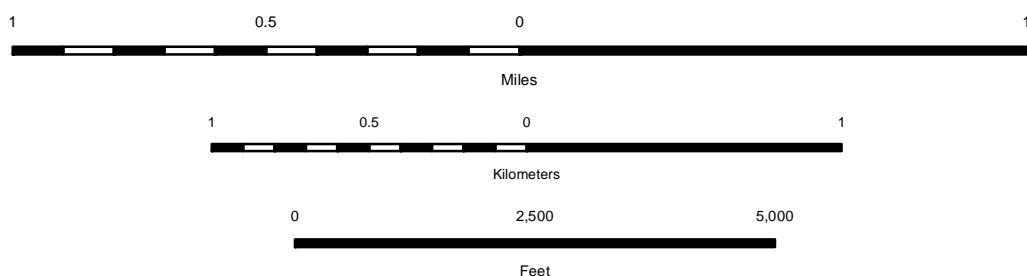


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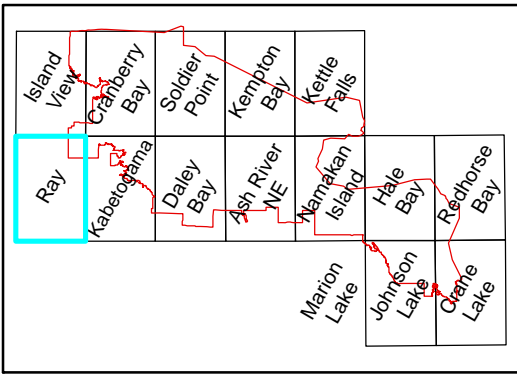
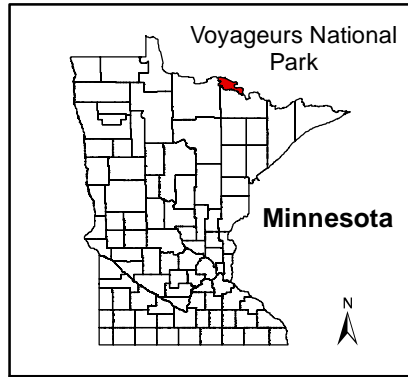
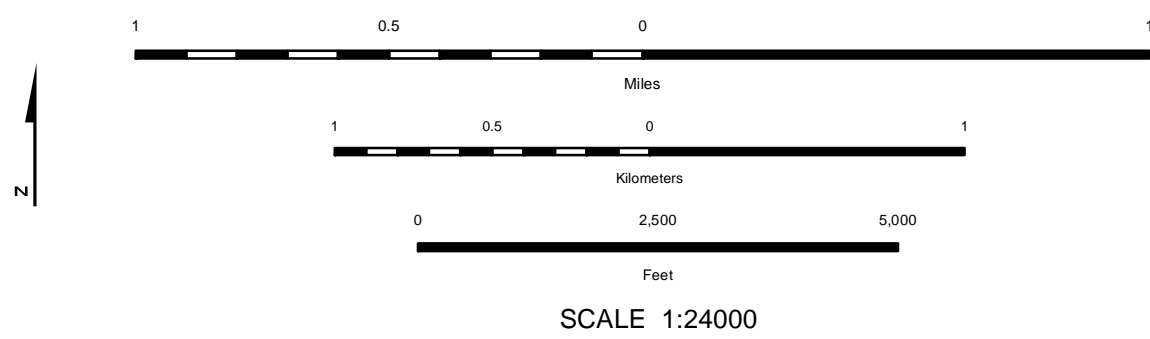


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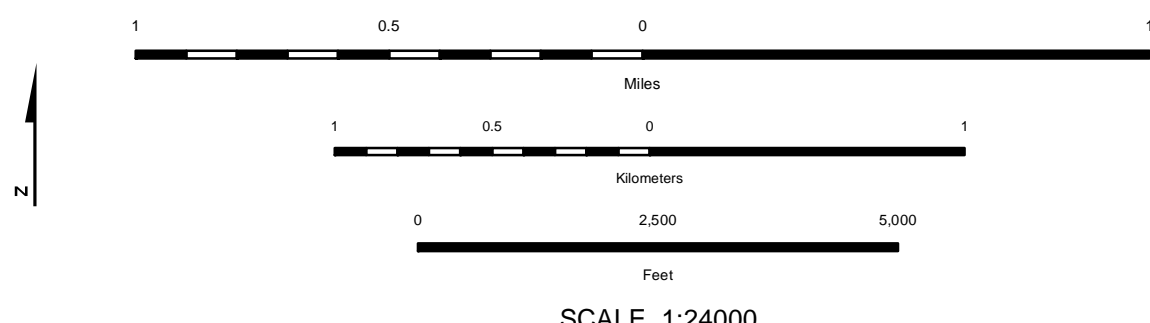
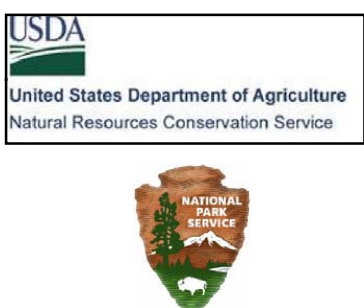


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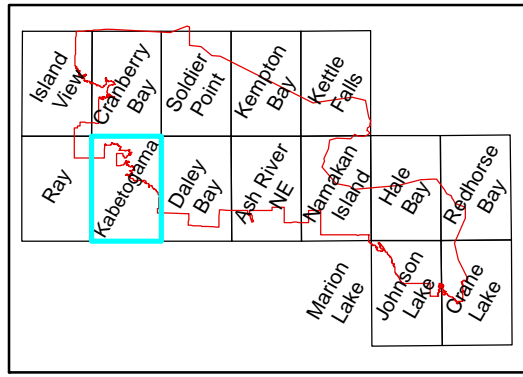
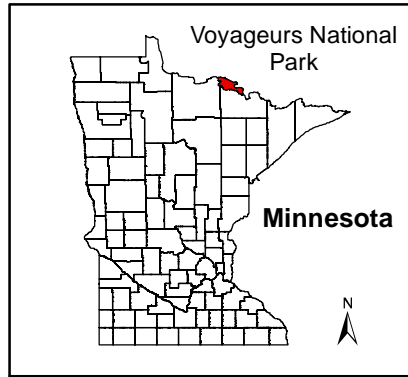
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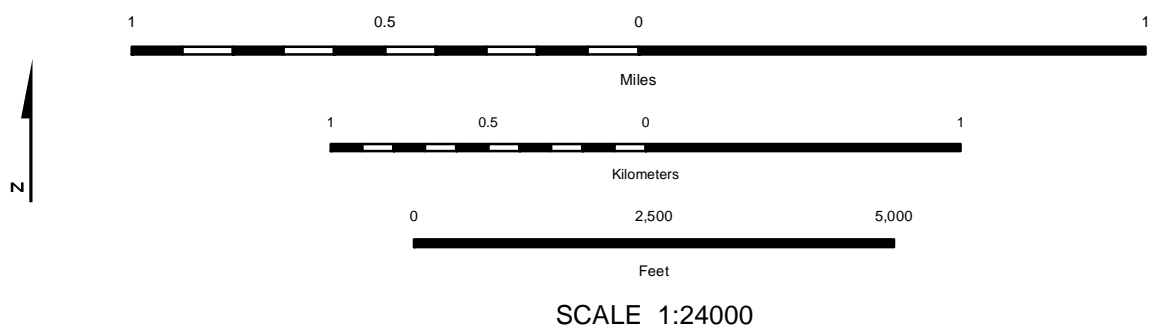


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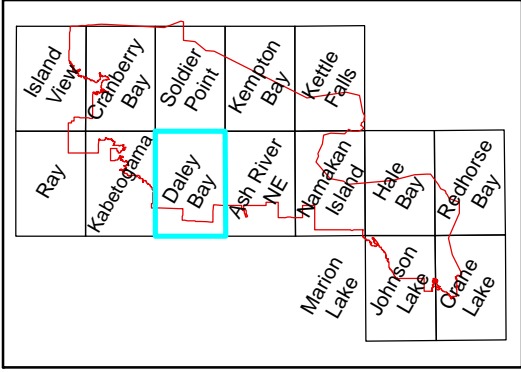
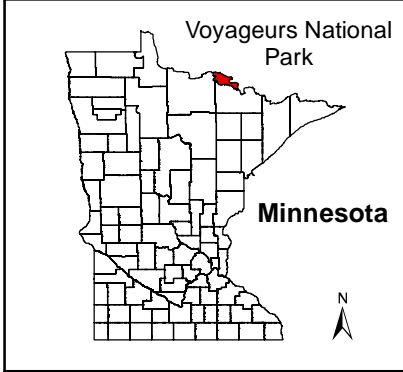
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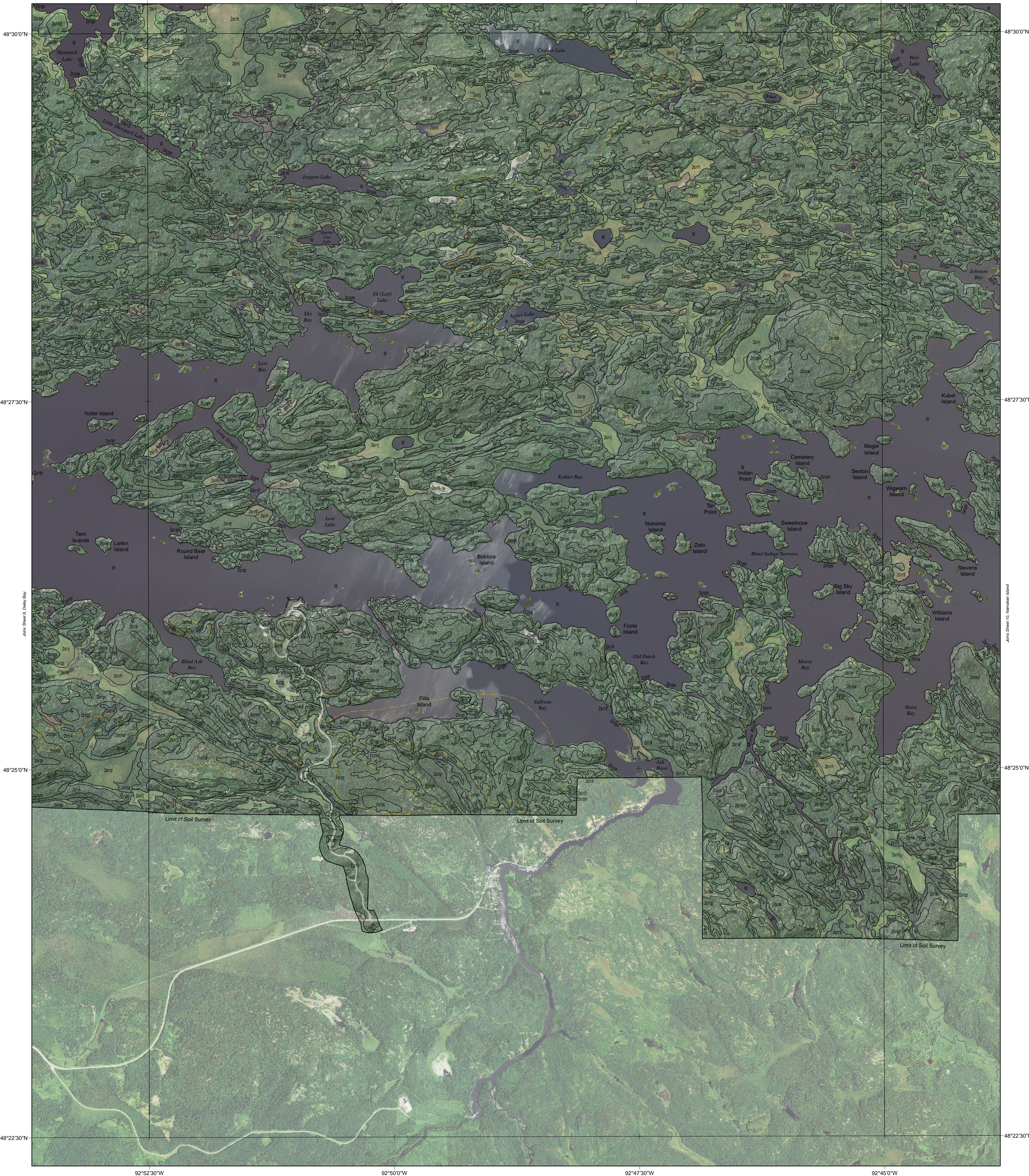
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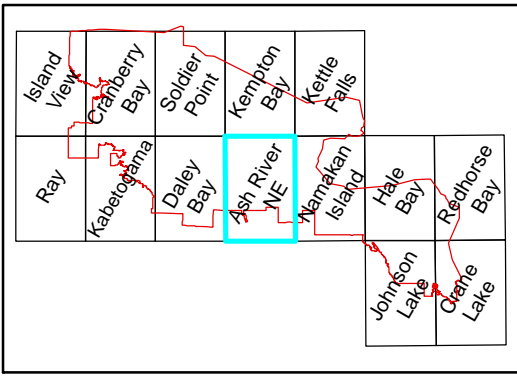
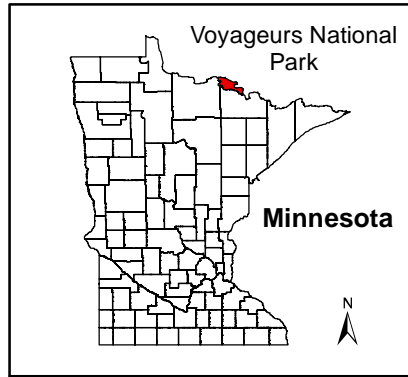
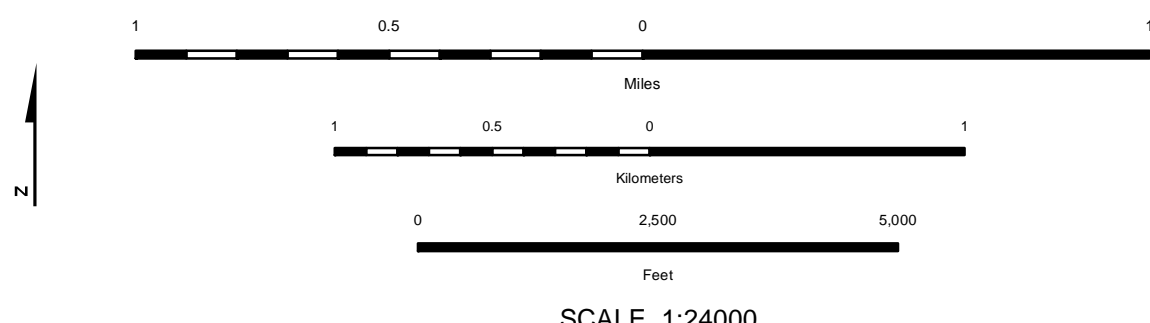


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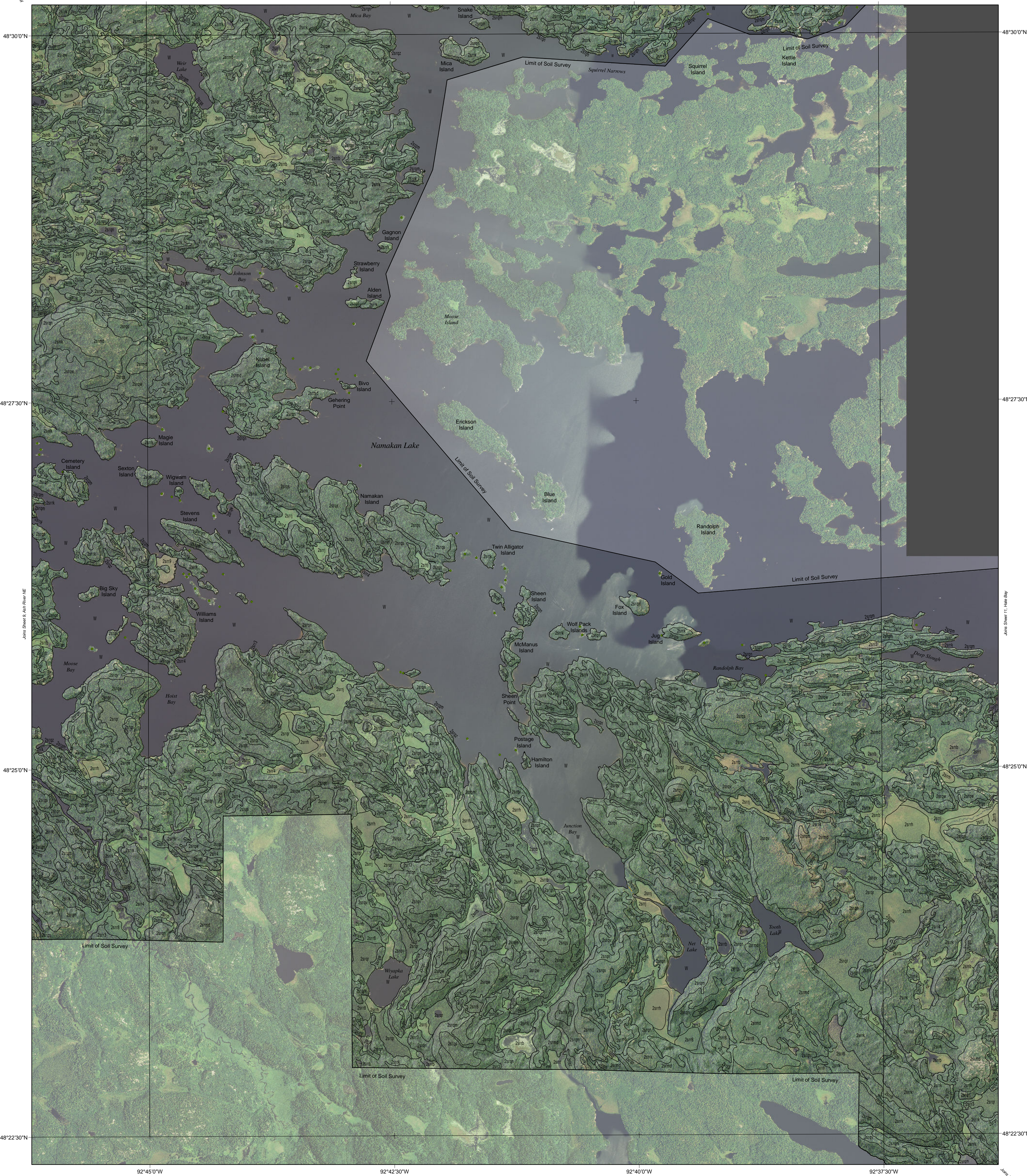
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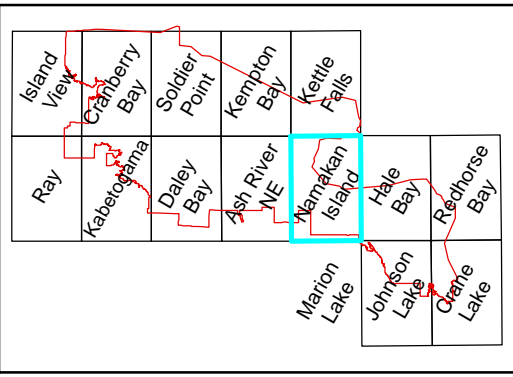
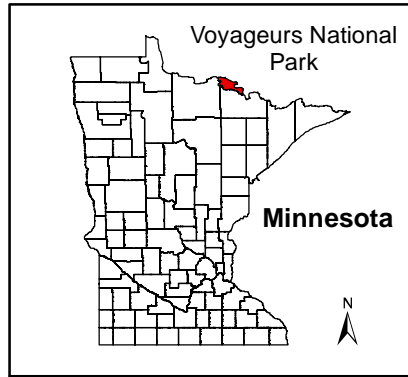
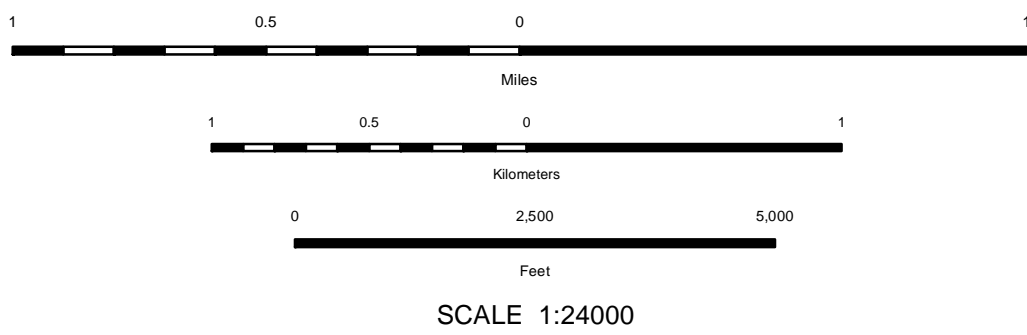


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Joins Sheet 5, Kettle Falls

UNITED STATES  
DEPARTMENT OF AGRICULTURE  
NATURAL RESOURCES CONSERVATION SERVICE

VOYAGEURS NATIONAL PARK  
HALE BAY QUADRANGLE  
SHEET NUMBER 11

92°35'0"W

92°32'30"W

92°30'0"W

48°30'0"N

48°30'0"N

48°27'30"N

48°27'30"N

48°25'0"N

48°25'0"N

48°22'30"N

48°22'30"N

92°37'30"W

92°35'0"W

92°32'30"W

92°30'0"W

Joins Sheet 14, Johnson Lake

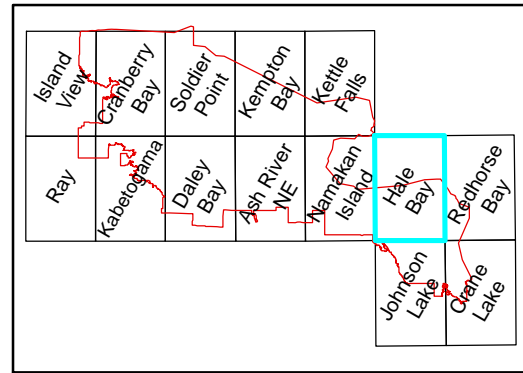
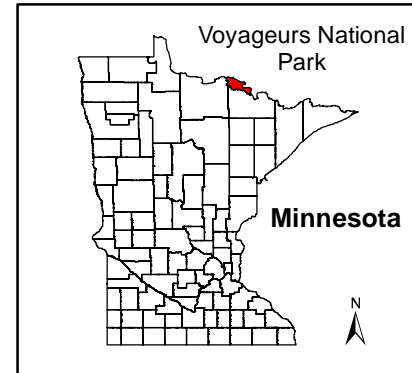
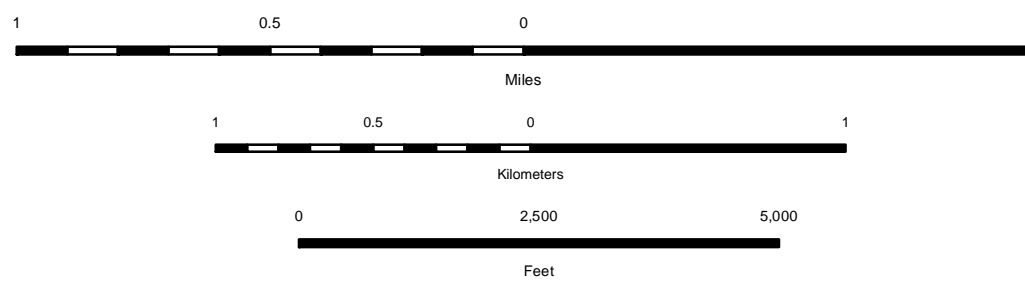
Joins Sheet 14, Crane Lake

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North American Datum of 1983 (NAD83).  
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VOYAGEURS NATIONAL PARK  
MINNESOTA

SHEET 11 OF 14



92°27'30"W

92°25'0"W

92°22'30"W

48°30'0"N

48°30'0"N

48°27'30"N

48°27'30"N

48°25'0"N

48°25'0"N

48°22'30"N

48°22'30"N

92°30'0"W

92°27'30"W

92°25'0"W

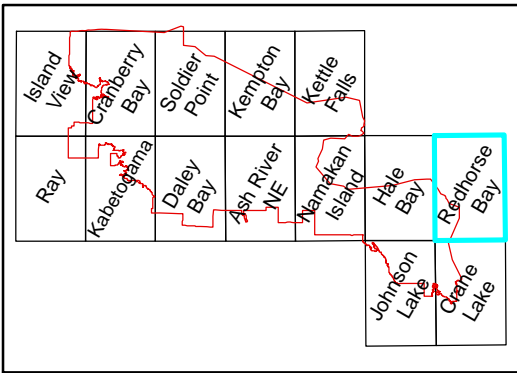
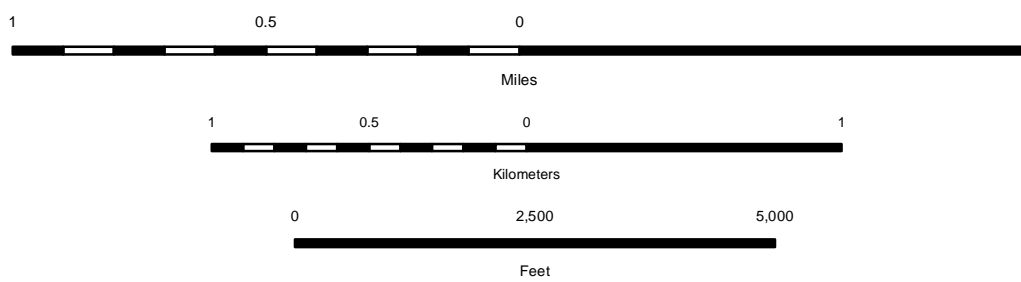
92°22'30"W

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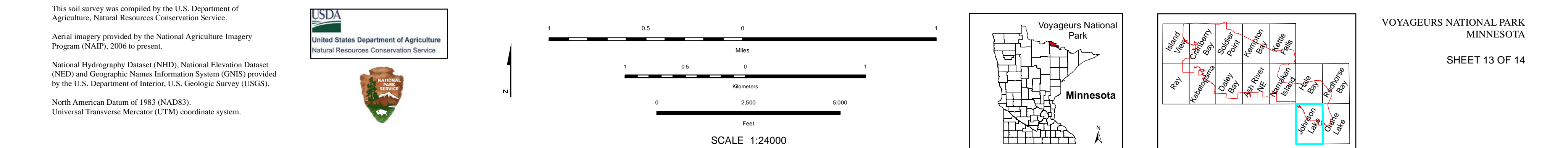
North American Datum of 1983 (NAD83).  
Universal Transverse Mercator (UTM) coordinate system.



VOYAGEURS NATIONAL PARK  
MINNESOTA

SHEET 12 OF 14









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